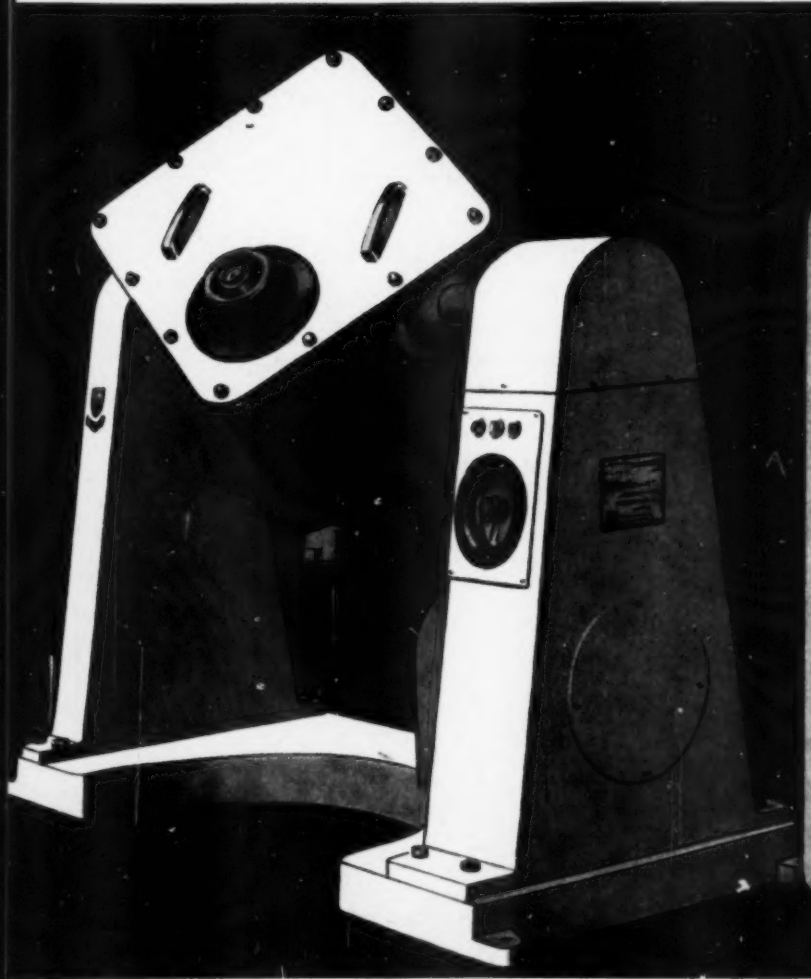
FIRE PREVENTION
AND FIRE FIGHTING

Manufacturing Chemist

incorporating

MANUFACTURING PERFUMER

Vol. XXX No. 2 A PUBLICATION OF THE LEONARD HILL TECHNICAL GROUP FEBRUARY, 1959



ROTOCUBE
mixing machines

The rapid action and outstanding efficiency of the Rotocube machine are derived from the three-dimensional mixing action, caused by the rotation of the diagonally mounted cube-shaped drum.

This complex action completely avoids any dead 'spots', so that mixing is carried out accurately, consistently and quickly. Where the materials are reasonably free-flowing, the Rotocube can be employed without the use of an impeller; this is advantageous where it is desired to avoid attrition and pulverizing. When an impeller is used, as it must be on ingredients which tend to agglomerate, it revolves slowly in the same direction as the drum, and thereby avoids any undue impacting of the materials. The machines are extremely easy to charge, discharge and clean.

Please mention "Manufacturing Chemist" when requesting further information.

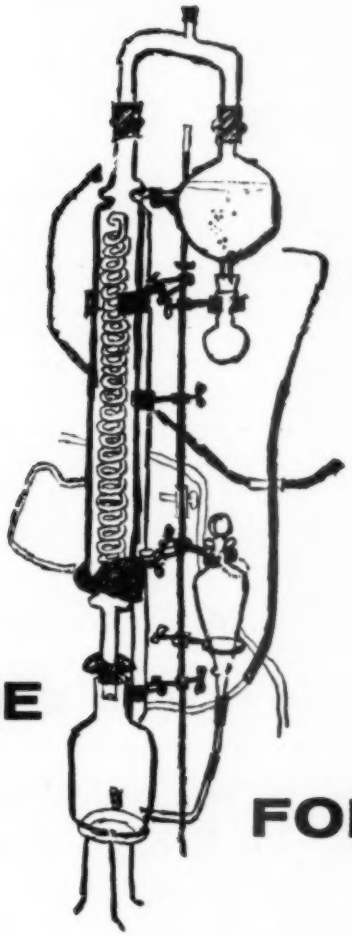
Foster Yates & Thom Ltd.

BLACKBURN, ENGLAND. TELEPHONE: BLACKBURN 4224

London Office: Terminal House, Grosvenor Gardens, S.W.1. Telephone Sloane 2255

Exclusive licensees for tubes with the Bickle sleeve.

INDEX TO



ROCHE FOR VITAMINS

A

Synthetic Vitamin A concentrates & powders
Synthetic beta-carotene

B

Aneurine Hydrochloride & Mononitrate
Riboflavin & Riboflavin 5'-phosphate
Nicotinic Acid & Amide
Calcium-D-pantothenate
Pyridoxine Hydrochloride

C

Ascorbic Acid & Sodium Ascorbate

E

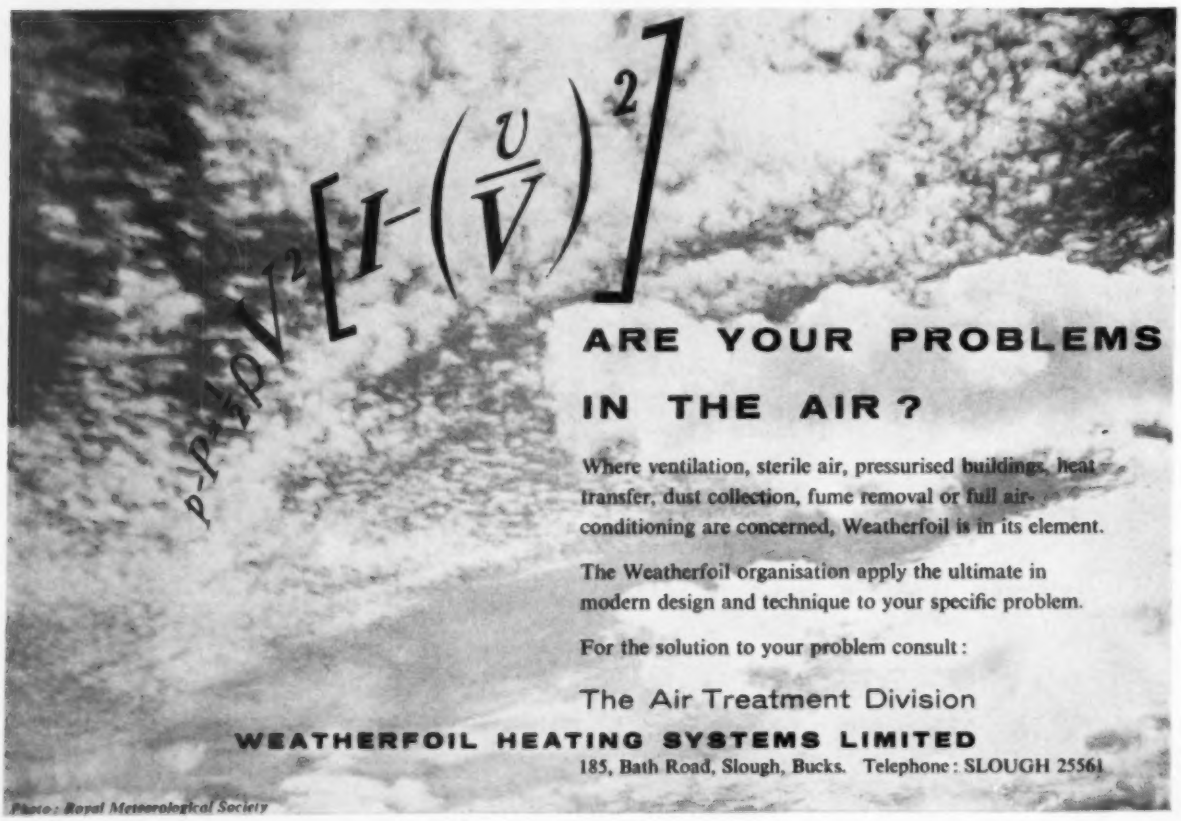
dl-alpha-Tocopheryl Acetate
dl-alpha-Tocopherol

Roche Products Limited, 15 Manchester Square, London, W.1

Roche are specialists in the large scale manufacture of pure synthetic vitamins
A comprehensive technical service backed by the international resources of the Roche organisation is available

INDEX TO ADVERTISERS

	Page
A.P.V. Co. Ltd., The	A12
Abril Industrial Waxes	Jan.
African Pyrethrum Tech. Information Centre Ltd.	A90
Air Drying and Conditioning Ltd.	A24
Aiton & Co. Ltd.	A33
Albro Fillers & Engg. Co. Ltd.	Jan.
Alginate Industries Ltd.	A62
Alite Machines Ltd.	Jan.
Allen, Stafford, & Sons Ltd.	Jan.
Alwitt Trading Co. Ltd.	A14
Amplex Appliances (Kent) Ltd.	Jan.
Anderson, C. F., & Son Ltd.	A63
Anhydro A/S	A44
Apex Construction Ltd.	Nov.
Arden, H. B., & Co. Ltd.	A88
Arthol Ltd.	A25
Ashby, Morris, Ltd.	A58
Atcost Ltd.	A59
B. & P. Laboratories Ltd.	Jan.
B.U. Supplies & Machinery Co. Ltd.	Dec.
Baird & Tatlock (London) Ltd.	Dec.
Baker Platinum Ltd.	Jan.
Barter Trading Corporation	A26
Beatson, Clark & Co. Ltd.	A16
Benjamin, The, Electric Ltd.	A15
Berk, F. W., & Co. Ltd.	A28
Betts & Co. Ltd.	Cover 2
Birlec Ltd.	A48
Bramigk & Co. Ltd.	A89
Briggs, S., & Co. Ltd.	A64
British Coca Co. Ltd.	Dec.
British Celanese Ltd.	A36
British Drug Houses Ltd., The	A6
British LaBour Pump Co.	A65
British Overseas Airways Corp.	A7
British Railways	Jan.
Broadbent, Thomas, & Sons Ltd.	A71
Brome & Schimmer Ltd.	Jan.
Brown, Arthur, & Co. Ltd.	Jan.
Burroughs Wellcome & Co. Ltd.	A8
Bush, Beach & Gent Ltd.	Dec.
Bush, W. J., & Co. Ltd.	A67
Butterfield, W. P., Ltd.	Nov.
Calfos Ltd.	Jan.
Calmic Engineering Co. Ltd.	Dec.
Cambridge Instrument Co. Ltd.	Oct.
Cape Building Products	A85
Carless, Capel & Leonard Ltd.	Jan.
Carlson, John C., Ltd.	A93
Carnegies of Welwyn Ltd.	A88
Chemapol	A40
Chemical, The, & Insulating Co. Ltd.	Jan.
Chemicals & Feeds Ltd.	A94
Chilean Iodine Educational Bureau	Jan.
China National Import & Export Corp.	A87
Clark, Geo. & Sons (Hull) Ltd.	A75
Clark, T. & C. Ltd.	A60
Clarke-Built Ltd.	Nov.
Classified Advertisements	A97-A98
Coalite & Chemical Products Ltd.	A11
Cocker Chemical Co. Ltd.	A62
Colodense Ltd.	A27
Cornwell Products Ltd.	Jan.
Cow, P. B., & Co. Ltd.	Nov.
Cox, Arthur H., & Co. Ltd.	A84
Crocq., Jean A. du Jr. N.V.	A76
Cumming, J. W., & Son Ltd.	A96
Dale, John, Ltd.	A41
Dawson Bros. Ltd.	Jan.
Deckelmann, Josef	A96
Dehydag	Nov.
Delf, W. M., (Liverpool) Ltd.	A92
Distillers, The, Co. Ltd.	A17
Dore, John, & Co. Ltd.	Jan.
Dragoco	Jan.
Dutton & Renisch Ltd.	Jan.
Edwards High Vacuum Ltd.	Nov.
Electrothermal Engineering Ltd.	A91
Engineering Dev. (England) Ltd.	Jan.
English Clays, Lovering Pochin & Co. Ltd.	A72
Evans Chemicals Ltd.	A82
Evans Medical Supplies Ltd.	Jan.
Evans, Norman, & Rais Ltd.	Jan.
Evode Ltd.	Dec.
Excorna	Dec.
Farrow & Jackson Ltd.	A83
Fatoils Ltd.	Jan.
Fisher's Foils Ltd.	A13
Flexile Metal Co. Ltd.	Dec.
Fluid Equipment Co. Ltd.	Dec.
Ford, T. B., Ltd.	A61
Foster, Yates & Thom Ltd.	Cover 1
Fritsch, Alfred	Nov.
Fritsch, Rudolph, W.	A88
Gale, Ronald, & Co. Ltd.	Jan.
Gardner, Wm., & Sons (Gloucester) Ltd.	Jan.
Gayler & Hall Ltd.	A92
Giusti, T., & Son Ltd.	Jan.
Givaudan, L., & Co. Ltd.	A79
Glass Containers Ltd.	A91
Glastics Ltd.	Jan.
Glaxo Laboratories Ltd.	A68
Glen Creston Ltd.	Jan.
Glovers (Chemicals) Ltd.	A34
Gosheron, John, & Co. Ltd.	A66
Graesser Salicylates Ltd.	Dec.
Graesser-Thomas, H. W., Ltd.	Jan.
Griffin & George Ltd.	Jan.
Gurr, Edward, Ltd.	A96
Haller & Phillips Ltd.	A94
Harris, F. & R. M., (Birm.) Ltd.	Nov.
Harvey, G. A., & Co. (London) Ltd.	Jan.
Hathernware Ltd.	Jan.
Haworth (A.R.C.) F., Ltd.	Jan.
Head Wrightson Processes Ltd.	Nov.
Herbert, Alford Ltd.	Dec.
Herbst, F., & Co.	A96
Hilger & Watts Ltd.	Jan.
Hobart Mfg. Co. Ltd.	Nov.
Honeywill Atlas Ltd.	A56
Honeywill & Stein Ltd.	Jan.
Horner, L. A., & Sons Ltd.	Jan.
Hunt & Moscrop Ltd.	Jan.
Ideal Capsules Ltd.	A68
Imperial Chemical Industries Ltd.	A38, A43
International Bottle Co. Ltd.	Jan.
Isopad Ltd.	A69
Jacobson Van Den Berg & Co. (U.K.) Ltd.	A21
Johnsen & Jorgensen Ltd.	A35
Johnson, S. H., & Co. Ltd.	Jan.
Jones, Samuel, & Co. Ltd.	Jan.

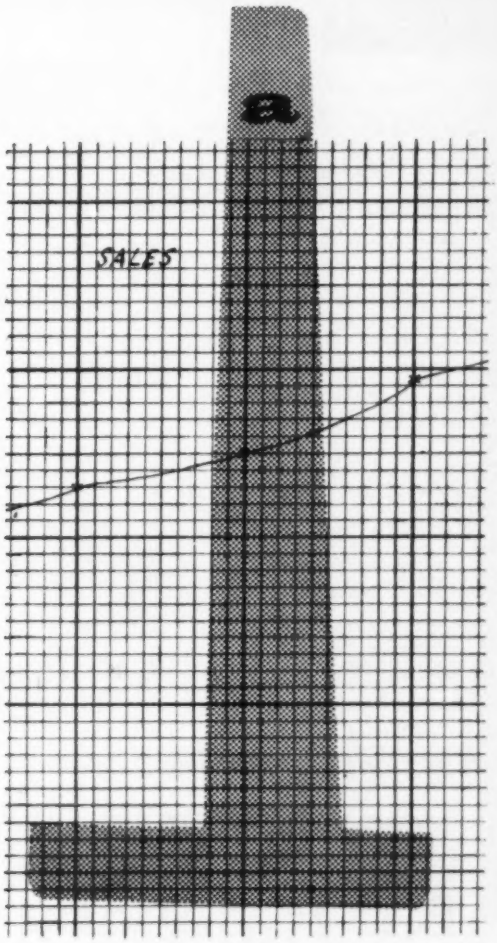

$p = P + \frac{1}{2}\rho V^2\left[1-\left(\frac{v}{V}\right)^2\right]$
ARE YOUR PROBLEMS
IN THE AIR?
Where ventilation, sterile air, pressurised buildings, heat transfer, dust collection, fume removal or full air-conditioning are concerned, Weatherfoil is in its element.
The Weatherfoil organisation apply the ultimate in modern design and technique to your specific problem.
For the solution to your problem consult:
The Air Treatment Division
WEATHERFOIL HEATING SYSTEMS LIMITED
185, Bath Road, Slough, Bucks. Telephone: SLOUGH 25561
Photo: Royal Meteorological Society

machinery
men
factory
products
raw material
and future production

impaired

should provision not be made for 'auto-thermatic'

system of automatic fire detection



Many more industrial organizations seek the security offered by 'Auto-thermatic'.

To keep ahead of the ever-growing problems of industrial fire hazard many new aevnues of approach involving advanced techniques in electronics, physics and system engineering are currently being explored.

Fire protection is a necessity and 'Auto-thermatic' automatic fire detection is the most sure way to achieve this.

The detectors have:

(a) *The approval of the Fire Offices' Committee,*

(b) *The approval of the Ministry of Power with a certificate for intrinsic safety where pentane and hydrogen class gases are used,*

(c) *The approval of the Ministry of Transport for installation in shipping*

and (d) *are the fastest acting detectors in use.*

sound diffusion (auto-thermatic) limited

243/247 COASTAL CHAMBERS, BUCKINGHAM PALACE ROAD, LONDON, S W 1 **telephone: sloane 0707-8**

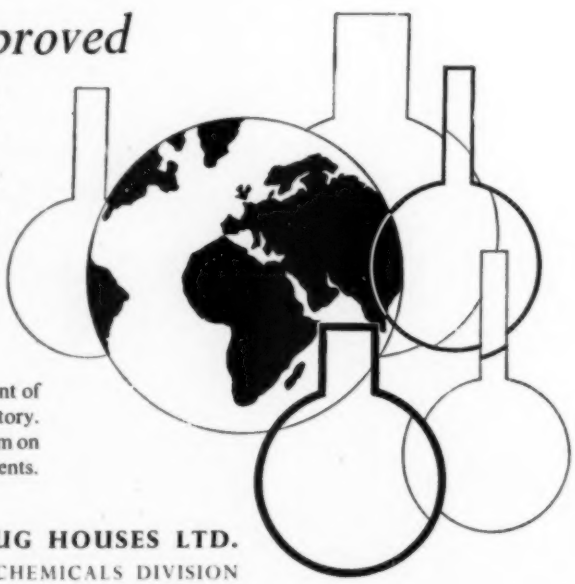
INDEX TO ADVERTISERS

	Page
Kaylene (Chemicals) Ltd.	A74
Kek Ltd.	Nov.
Kellys, John, (London) Ltd.	A94
Kemball, Bishop & Co. Ltd.	A89
Kemwall Engineering Co.	Nov.
Kendall, F., & Son Ltd.	A94
Kestner Evaporator & Engg. Co. Ltd.	A66
Kolmar Cosmetics (England) Ltd.	Nov.
Kork-N-Seal Ltd.	Dec.
K. W. Chemicals Ltd.	A90
Lankro Chemicals Ltd.	Jan.
Lattimer, H.	A96
Lautier Fils	A30
Lavino (London) Ltd.	A53
Lawtons of Liverpool Ltd.	Dec.
Lax & Shaw Ltd.	Jan.
Lennox Foundry Co. Ltd.	Dec.
Leverton Myers Ltd.	Jan.
McKesson & Robbins Ltd.	A96
Maine, B. Newton, Ltd.	A70
Manchester Oil Refinery (Sales) Ltd.	A31
Manesty Machines Ltd.	Jan.
Manlove Alliot & Co. Ltd.	Jan.
Manning, A. J., Ltd.	Jan.
Marchon Products Ltd.	A37
Mark-o-Print Ltd.	Jan.
Martin, W. H., Ltd.	A92
Mason & Morton Ltd.	A58
May & Baker Ltd.	A42
Metafiltration Co. Ltd., The	Jan.
Metal Box Co. Ltd.	A45, Cover 4
Metal Closures Ltd.	Cover 3
Metal Hydrides Inc.	Jan.
Metalitho Ltd.	Dec.
Miller, Joseph & Sons Ltd.	Jan.
Mitchell, L. A., Ltd.	Jan.
Mono Pumps Ltd.	A78
Monsanto Chemicals Ltd.	Dec.
Morgan Fairest Ltd.	Dec.
Moritz Chemical Engg. Ltd.	Jan.
Morson, Thomas, & Son Ltd.	A64
National Glass Work (York) Ltd.	A46
Olley, C., & Sons Ltd.	A90
Page, Chas., & Co. Ltd.	A96
Palfrey, Wm. Ltd.	Dec.
Pascall Engineering Co. Ltd.	Nov.
Paterson Engineering Co. Ltd.	A80
Pearce, L. R. B., Ltd.	Jan.
Pearlite Box Co. Ltd.	Dec.
Peerless & Ericsson Ltd.	A77
Petley, P. T. & Co. Ltd.	A92
Petrie & McNaught Ltd.	A52
Petrochemicals Ltd.	Dec.
Pfizer Ltd.	Jan.
Pharmaceutical Press, The	Dec.
Plastic Closures Ltd.	Cover 3
Plenty & Son Ltd.	A10
Polak & Schwarz Ltd.	A50
Poth, Hille & Co. Ltd.	A70
Potter & Clarke Ltd.	A78
Premier Colloid Mills Ltd.	Dec.
Price's (Bromborough) Ltd.	A18
Purdy Machinery Co. Ltd.	A83
Pye, W. G. & Co. Ltd.	A88, A95
Pyrene Co. Ltd.	A72
Pyrocell Mfg. Co.	Nov.
Q.V.F. Ltd.	A57
Quickfit and Quartz Ltd.	Dec.
Read & Campbell Ltd.	A56
Reads Ltd.	A9
Reed, R. F., Ltd.	A60
Reed Corrugated Cases Ltd.	A51
Rejafix Ltd.	Jan.
Renham & Romley Ltd.	Jan.
Rhone-Poulenc, Soc. de Usines Chimiques	Jan.
Richford, E. M., Ltd.	A86
Riley (IC.) Products Ltd.	A19
Roberts Patent Filling Machine Co. Ltd.	A74
Robinson Brothers Ltd.	Jan.
Robinson & Sons Ltd.	Jan.
Roche Products Ltd.	A3
Rockwell Pneumatic Scale Ltd.	A20
Rodway & Taylor	Dec.
Ronsheim & Moore Ltd.	Jan.
Roussel Laboratories Ltd.	Nov.
Russell Constructions Ltd.	Jan.
Saniguard Appliances Ltd.	A84
Scandinavian	Dec.
Scherer, R. P., Ltd.	Jan.
Service Electric Co. Ltd.	Jan.
Shandon Scientific Co. Ltd.	A85
Shell Chemical Co. Ltd.	A32
Silverson Machine (Sales) Ltd.	A87
Simpson, W. S., & Co. Ltd.	A96
Sipon Products Ltd.	Nov.
Smith, T. & H., Ltd.	A22
Smiths Industrial Inst. Div.	Jan.
Sound Diffusion Ltd.	A5
Southern Apparatus Co. Ltd.	A95
Spicers Ltd.	A73
Stabilag Co. Ltd., The	A80
Standard Synthetics Ltd.	Jan.
Staveley Iron & Chemical Co. Ltd., The	A39
Steel, J. M., & Co. Ltd.	Jan.
Stephens Bros. & Banner Ltd.	Nov.
Sturge, J. & E., Ltd.	A47
Sturtevant Engineering Co. Ltd.	A49
Sutalice Ltd.	Nov.
Sutcliffe Speakman & Co. Ltd.	Jan.
Tan-Sad Chair Co. (1931) Ltd.	Jan.
Taylor Rustless Fittings Co. Ltd.	A93
Tennants (Lancashire) Ltd.	A86
Thames Board Mills Ltd.	Jan.
Thames Sack & Bag Co. Ltd.	A54
Thermocontrol Installations Ltd.	Nov.
Thompson & Capper Ltd.	A55
Trade Agent for Mysore	A90
Trade Commissioner for the British West Indies, British Guiana and British Honduras	A96
Trapow, D. & Co. Ltd.	Jan.
Tungstone Products Ltd.	A81
Tye, John, & Son Ltd.	Nov.
Ultasonics Ltd.	Dec.
Union Carbide Ltd.	Jan.
United Glass Bottle Manfrs. Ltd.	Jan.
United Indigo & Chemical Co. Ltd.	A94
Universal Metal Products Ltd.	Oct.
Universal Oil Co. Ltd.	Jan.
Venesta Ltd.	Jan.
Viscose Development Co. Ltd.	A23
Vitamins Ltd.	Dec.
Voss Instruments Ltd.	Jan.
Warwick Production Co. Ltd.	Nov.
Weatherfoil Heating Systems Ltd.	A4
Welch, J. A. (Plant and Vessel) Ltd.	Jan.
Westbrook Lanolin Co.	Dec.
Whaley, Bridge Manufacturing Co.	A95
White Sea and Baltic Co.	Jan.
Willcox, W. H., Co. Ltd.	A29
Woodhams, Dade & Co.	A94
Wood-Wool & Fibre Co. Ltd.	Jan.
Wynmouth Lehr & Co. Ltd.	A96
Wynn (Valves) Ltd.	A82

B.D.H. Laboratory Chemicals

are internationally approved

Daily use in more than seventy countries has established the international reputation of B.D.H. Laboratory Chemicals. Over six thousand products, including 'AnalaR' reagents, organic and inorganic fine chemicals, indicators, biochemicals, stains for microscopy, 'organic' and other special reagents are provided by the B.D.H. Laboratory Chemicals Division, upwards of a thousand of them under 'specification' labels.



To customers overseas:
Catalogues, leaflets and booklets from the wide assortment of B.D.H. technical literature will be useful in your laboratory. The Export Department at Poole will be happy to send them on request, and advise you about local marketing arrangements.

BDH

THE BRITISH DRUG HOUSES LTD.
B.D.H. LABORATORY CHEMICALS DIVISION
POOLE **DORSET**

BOAC OFFERS FASTEST OVERNIGHT CARGO SERVICE TO AMERICA

Fly your cargo to New York by the *fastest overnight service*—by BOAC jet-prop *Britannia*.

High-speed air transport demands absolute efficiency in handling, loading, Customs clearance and delivery . . . and this is where BOAC is supreme, at both London Airport and Idlewild. Goods collected by BOAC van by 5 p.m. in the London area, or received at London Depot by 7.30 p.m., reach New York next morning —and consignments from the provinces and London area received at London Airport by 10 p.m. are in New York before breakfast next day!

Goods for Canada received by 7 a.m. reach Montreal by afternoon. There are evening departures from London too! Ring BOAC, ask for "Skyload" and talk to BOAC's cargo specialists. You arrange shipment on the spot. This is a service no other airline can match. Consult your local BOAC Appointed Forwarding Agent, or any BOAC office, for full details.

ALL OVER THE WORLD

B·O·A·C

TAKES GOOD CARE OF YOUR CARGO

BRITISH OVERSEAS AIRWAYS CORPORATION

"A thing of beauty is a joy for ever"

"But beauty faded has no second spring"

"Absence makes the heart grow fonder"

"Out of sight out of mind"

"Too many cooks spoil the broth"

"Many hands make light work"

Competitive quotations on request

—for Adrenaline, Atropine, Benzamine Salts, Bismuth Salts, Carbachol, Cinchophen, Emetine and E.B.I., Ephedrine, Ergometrine, Homatropine, Hyoscine, Hyoscyamine, Ouabain, Physostigmine, Pilocarpine, Quinine, Strophanthin-K, Sulphaguanidine, and many other alkaloids and glycosides.

B.W. & CO. FINE CHEMICALS

BURROUGHS WELLCOME & CO. *(The Wellcome Foundation Ltd.)* LONDON

If it's Containers you want, good ones...

I wish someone would come up with a new kind of container to replace the heavy glass carboys we use.

You haven't heard of the Armadillo, then?

No, what is it, sounds fearsome?

It's a new drum specially made for your line of business. 5 or 10-gallon capacity, recessed for stacking, and with a non-drip reversible pouring spout. It . . .

Yes, that's all very well, but, I want something which will take acids and other corrosive chemicals.

Quite, I was coming to that. We've developed the Armadillo container in conjunction with Cascelloid who supply the exceptionally tough semi-rigid polythene bottle which fits inside the drum, an inner liner made to withstand the fierce activity of chemical corrosion. 'Double-wall' strength, in fact! That's why the Armadillo can be used many times.

Armadillo, you say. Good name. Tell me more.

Well, it's made from 22 or 24 gauge metal and measures 14" x 21⅜" in the 10-gallon size and 11" x 18¼" in the 5-gallon size. The drum has a full aperture with a hoop closure and an expansion at the top to make it even stronger. There's an anti-pilfer seal and it can be supplied with an escape valve for excess gases, which has been developed to meet the wishes of chemical manufacturers. All parts are replaceable and . . .

All right, I'm sold. Let's see what we can do about fixing up a trial order.

READS
OF LIVERPOOL

are always at your service

READS LTD., ORRELL HOUSE
ORRELL LANE, WALTON, LIVERPOOL 9
PHONE: AINTREE 3600

PLENTY FOR PUMPS and Complete Process Plants

Illustrated is a Plenty Variable Delivery Pump, fitted with air controller and valve positioner to give accurate remote control of flow and pressure.

Similar units have been supplied to Ewbank & Partners Limited, Shell Refining Company Limited, Central Electricity Generating Board, Procon (Great Britain) Limited, Thos. Hedley & Company Limited, and many others.

PLENTY
& SON Ltd.

Eagle Iron Works,
NEWBURY, Berks.
Telephone: NEWBURY 2363 (4 lines)
Telegrams: PLENTY, NEWBURY

M.C.
A10

The consistent quality of "Coalite" Chemicals is ensured by the use of modern scientific aids such as the infra-red spectrograph (shown above) which carries out routine analysis on all our products.

CHLORINATED PHENOLIC COMPOUNDS

2 : 4 Dichlorophenol.
2 : 4 : 6 Trichlorophenol.
Para Chloro Ortho Cresol.
6. Chloro Ortho Cresol.
Dichloro Meta Xylenol (D.C.M.X.)
Chlorinated Xylenols.
Para Chloro Phenol.

HIGH BOILING TAR ACIDS

including white emulsion grades for use in high quality disinfectant fluids.

FULL RANGE OF CRESYLIC ACIDS

including : Phenol • Ortho Cresol • Meta/Para Cresol • Xylenols—blended to consumers requirements.

DIHYDRIC PHENOLS

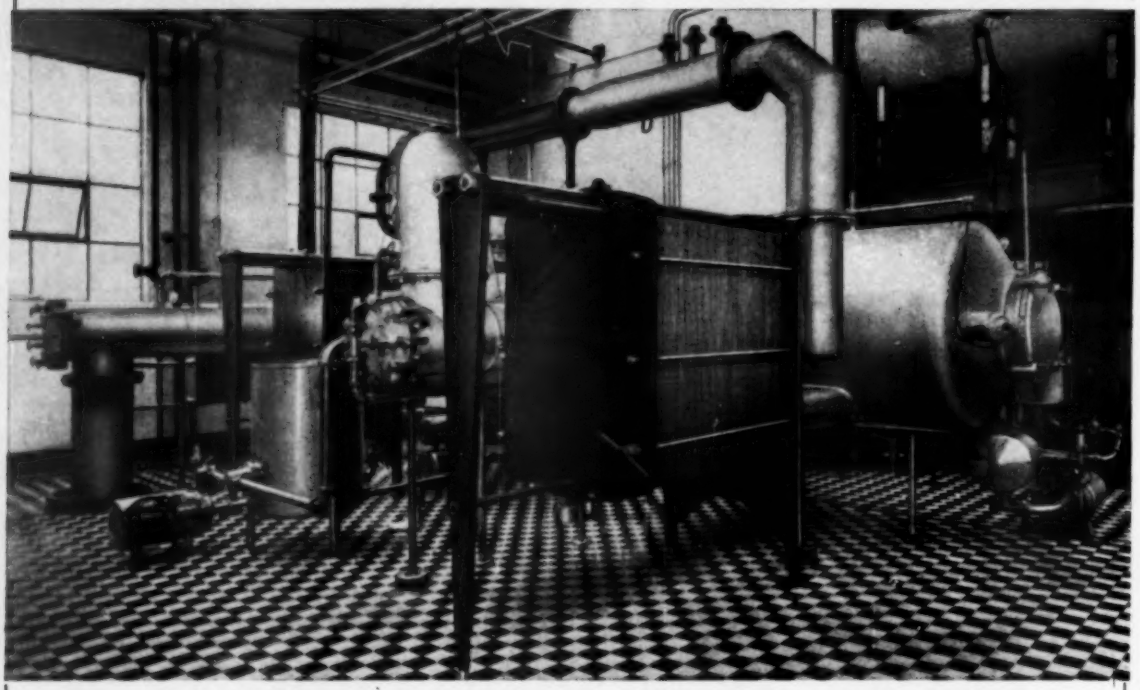
including Catechol, Tertiary Butyl Catechol, Methyl Catechols and Methyl Resorcinols.

COALITE AND CHEMICAL PRODUCTS LTD

CHESTERFIELD . DERBYSHIRE *Telephone*: BOLSOVER 2281/6

Your enquiries are welcomed and literature describing the 'Coalite' range of products is available on request.

AN OUTSTANDING DEVELOPMENT IN EVAPORATION



APV Double Effect Plate Evaporator with thermo-compression at the Uttoxeter Condensory of Wilts United Dairies Ltd.

The APV Plate Evaporator has quickly aroused considerable interest as a continuous evaporating unit of new and revolutionary design.

By using plates on the climbing and falling film principle, instead of tubes, a very simple and compact evaporator results that requires only eight feet of headroom. The saving in first and installation costs is appreciable.

A number of APV Plate Evaporators are already in very successful operation on milk and fruit juices. This type of evaporator is equally applicable to a wide range of other duties and has pronounced advantages for many, particularly for heat sensitive liquids.

Overall cost is lower.

Height under 9 feet.

No supporting steelwork needed.

One-level operation.

Two controls only.

Capacity readily altered.

Fully accessible for cleaning.

Extremely low product hold-up.

Ideal for heat sensitive liquids.

APV PLATE EVAPORATOR

The A.P.V. Company Ltd., Manor Royal, Crawley, Sussex Telephone: Crawley 1360. Telex: 8737

Telegrams: Anaclastic, Crawley

5 OF THE BEST...

These five materials were developed to meet customers' special requirements.

LET OUR TECHNICAL SALES DEPARTMENT HELP YOU!

Phone for our representative to call and see you.

FISHER'S FOILS

FISHER'S FOILS LTD. EXHIBITION GROUNDS, WEMBLEY, MIDDLESEX, ENGLAND

TELEPHONE: WEMBLEY 6011 *GRAMS: LIOFNIT WEMBLEY*

„Knoll" Fine Chemicals

enjoy world-wide reputation

Barbonin®
(6,7-diaethoxy-1-[3,4-diaethoxy-benzyl]-isochinoline)

Bromoisovalerylurea (Bromvaletone B.P.C.)

Caffeine Alkaloid and salts

Ephedrine, its salts and derivatives

Papaverine and its salts

Pentamethylenetetrazol (Leptazol B.P.)

Theophylline, its salts and derivatives

Theophylline Ethylene Diamine

•

„Knoll" Fine Chemicals are distinguished by their purity and meet the requirements of the prominent pharmacopœias.

KNOLL

Marketed by
Alwitt Ltd.
1, Broad Street Place
LONDON, E.C.2

KNOLL A.-G. · Chemical Works · Ludwigshafen-on-Rhine

Introducing

THE **TASKMASTER** RANGE

A Contemporary streamlined range of

FLUROLIER Regd. fittings

with a NEW LOOK and NEW PRICES

Modern manufacturing methods spearhead a new price range of 'TASKMASTER' 'Crysteel' vitreous enamel 'Flurolier' fittings. Also available in 'Peropal' stove enamel finish, and acrylic plastic reflectors.

better lighting by

BENJAMIN REGD.

Please write for this fully illustrated brochure of TASKMASTER FITTINGS.

THE BENJAMIN ELECTRIC LIMITED
TOTTENHAM · LONDON · N17
Tel: TOTtenham 5252 (5 lines) *Grams:* Benjalect Southtot London

BIRMINGHAM: 5 Corporation St., Birmingham 2. *Tel: Midland 5197*
BRISTOL: Royal London Building, Baldwin St., Bristol. *Tel: Bristol 28406*
LEEDS: 49 Basinghall St., Leeds 1. *Tel: Leeds 25579*

Smee's 139

The Beatson Tablet

WHITE FLINT or AMBER

- ★ **Distinctive SQUARE Shape.**
- ★ **Black Plastic or White Enamelled Caps.**
- ★ **Production Clean in Sealed Cartons.**
- ★ **Prompt Despatch from Stock.**
- ★ **Available in the following sizes:**
  3dr ¼ ½ 1 1½ 1¾ 2 3 3½ oz.

"The Sign of a *Good Bottle"*

Suggested Packs:

¼-oz.—25 Aspirin.
1-oz.—50 Aspirin or 25 Codeine.
1¼-oz.—100 Aspirin or 50 Codeine.
3½-oz.—100 Codeine.

Beatson, Clark & Co., Ltd.
GLASS BOTTLE MANUFACTURERS
ROTHERHAM ESTABLISHED 1751 YORKS.

Be sure to specify BEATSON

BTI(R)

D.C.L. chemicals

Industrial Alcohol

BISOL Solvents · Plasticisers

Intermediates · Calcium Carbide

Liquid Carbon Dioxide

Solid Carbon Dioxide

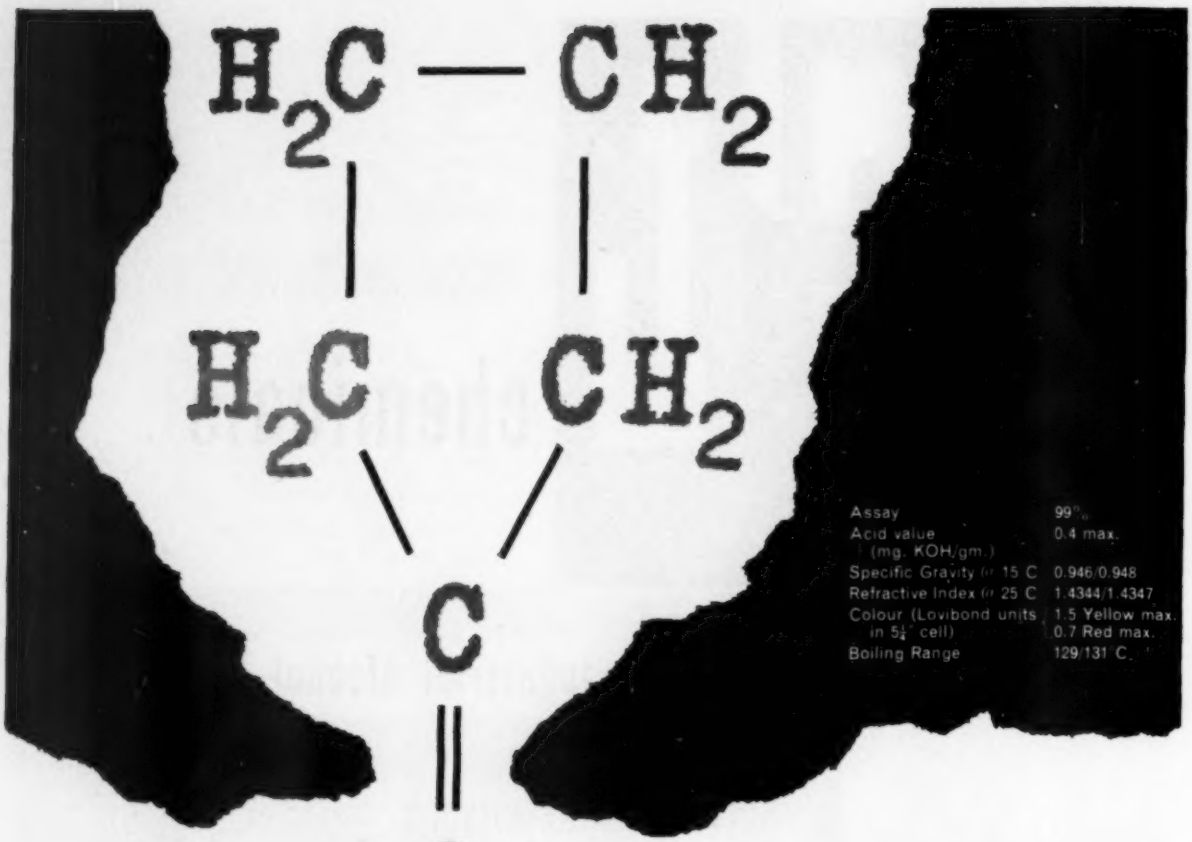
Sales Agents for

Petroleum Chemicals made by British Hydrocarbon Chemicals Limited

THE DISTILLERS COMPANY LIMITED

CHEMICAL DIVISION

DEVONSHIRE HOUSE · PICCADILLY · LONDON W.1



Assay	99%
Acid value (mg. KOH/gm.)	0.4 max.
Specific Gravity @ 15 C	0.946/0.948
Refractive Index @ 25 C	1.4344/1.4347
Colour (Lovibond units in 5¼" cell)	1.5 Yellow max. 0.7 Red max.
Boiling Range	129/131 C.

Cyclopentanone

Price's now offer Cyclopentanone of guaranteed quality in commercial quantities. This colourless mobile liquid is of interest as:—

Perfumery and Flavouring Intermediate. Cyclopentanone undergoes a number of reactions including self-condensation and condensation with carbonyl compounds, alkylation, halogenation and hydroxylation, giving rise to a series of compounds of interest to the Perfumery and Flavouring Industries.

Chemical Intermediate. Cyclopentanone undergoes both oxidation and reduction. Reaction with hydrogen peroxide gives hydroperoxides which may be of interest as polymerisation initiators, as plasticisers, or as starting materials for synthetic resins. Another possible use is as the starting point for the production of insecticides.

General Solvent. Particularly in the Plastics Industry and in the manufacture of Paint Strippers.

Cyclopentanone is packed in aluminium containers and is available in large or small quantities—from 8 oz. upwards. Why not send for a sample for evaluation?

PRICE'S (Bromborough) LIMITED

Bromborough Pool, New Ferry,
Nr. Birkenhead.
Tel. Rock Ferry 2020

OLEINES · STEARINES · FATTY ACIDS · FATTY ALCOHOLS · TEXTILE OILS

PB 57-8098-120

Materials Move as you want them to move

with simple rheostat control

- Gives complete control of FLOW.
- Fully automatic. No supervision needed.
- Simple design and robust construction — negligible maintenance.
- Ready for immediate installation.

SYNTRON VIBRATION

KEEPS THINGS MOVING

Full details of Syntron Electric Vibratory Equipment from: RILEY (IC) PRODUCTS LIMITED

One of the International Combustion Group of Companies. Nineteen Woburn Place, London, W.C.1. Telephone No : Terminus 2622

TGA 549

Only PNEUMATIC SCALE

offers these exclusive advantages—

✓ **POSITIVE APPLICATION**
✓ **GREATEST FLEXIBILITY**
✓ **CONTROLLED TORQUE**

with the

'PNEUMACAP'

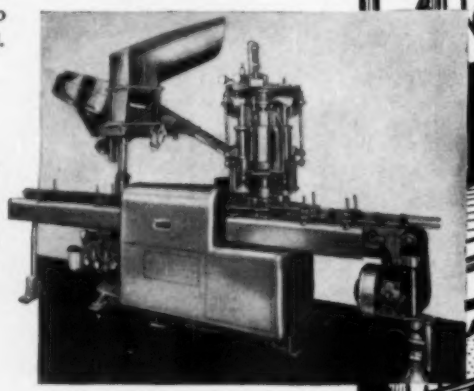
MULTI-HEAD CAPPER

Simple positive non-slipping grip for all types of pre-threaded closures. Particularly efficient for fragile moulded closures.

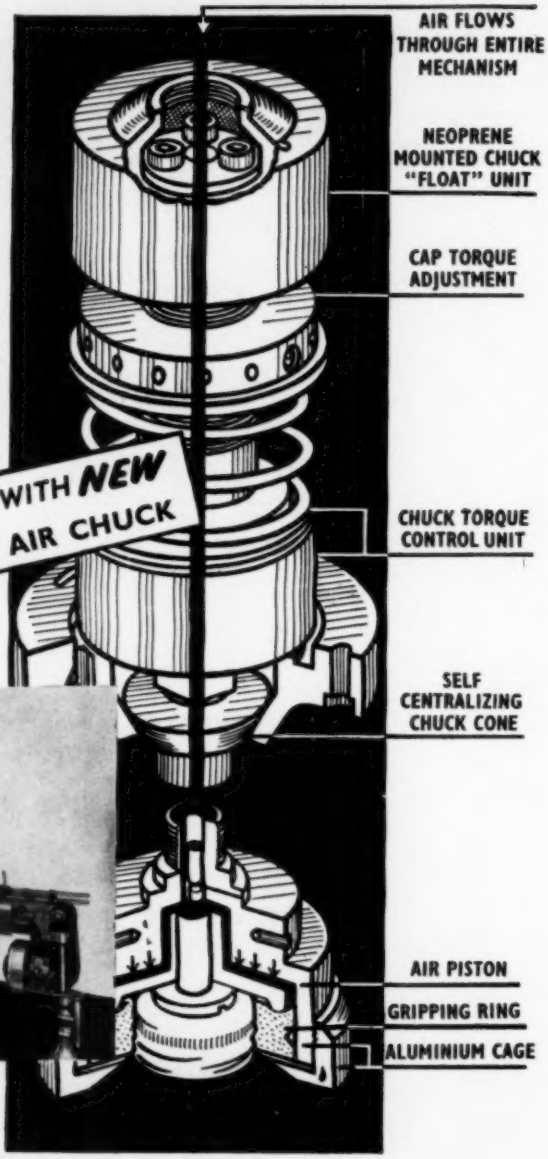
The Pneumacap is available in 4, 6 or 8 head models, each completely automatic and operating with exclusive design air chuck (see diagram). Helical Feed Intake, Individual, synchro or line shaft drive as desired.

SPEED
Up to 240 per minute.

CAPACITY
Max. container dia. 4".
Max. cap size 89 m/m.



Pneumacap 4-head Model.

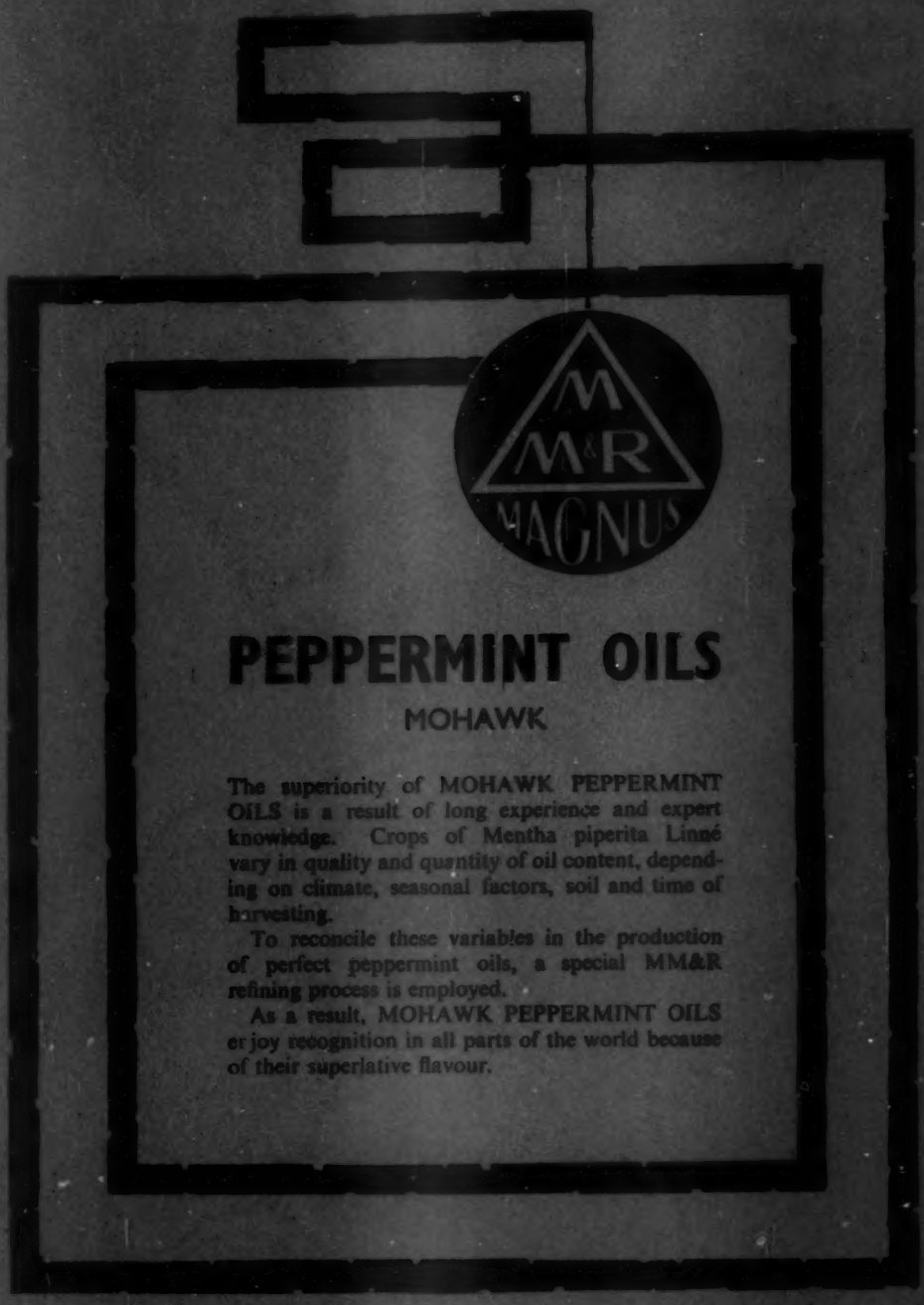


PNEUMATIC SCALE
BRITISH BUILT by **VICKERS**

ROCKWELL PNEUMATIC SCALE LTD

WELSH HARP · EDGWARE ROAD · LONDON N.W.2 · TEL: GLADSTONE 0033

PS.PNEUMACAP



PEPPERMINT OILS

MOHAWK

The superiority of MOHAWK PEPPERMINT OILS is a result of long experience and expert knowledge. Crops of Mentha piperita Linné vary in quality and quantity of oil content, depending on climate, seasonal factors, soil and time of harvesting.

To reconcile these variables in the production of perfect peppermint oils, a special MM&R refining process is employed.

As a result, MOHAWK PEPPERMINT OILS enjoy recognition in all parts of the world because of their superlative flavour.

J V D B

Sole U.K. Representatives

JACOBSON VAN DEN BERG & CO. (U.K.) LTD.

International Merchants and Importers and Exporters of Essential Oils since 1861

3-5 CRUTCHED FRIARS, LONDON, E.C.3 ROYal 7664 (5 lines)

MAGNUS, MABEE & REYNARD, INC.

Since 1895 . . . The World's Most Famous Supplier of Essential Oils, Basic Perfume Oils, and Concentrated Flavors

16 DESBROSSES STREET, NEW YORK, 13, NEW YORK, U.S.A.

Only PNEUMATIC SCALE

offers these exclusive advantages—

✓ **POSITIVE APPLICATION**
✓ **GREATEST FLEXIBILITY**
✓ **CONTROLLED TORQUE**

with the

'PNEUMACAP'

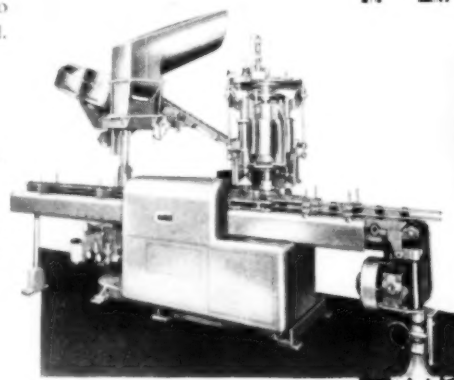
MULTI-HEAD CAPPER

Simple positive non-slipping grip for all types of pre-threaded closures. Particularly efficient for fragile moulded closures.

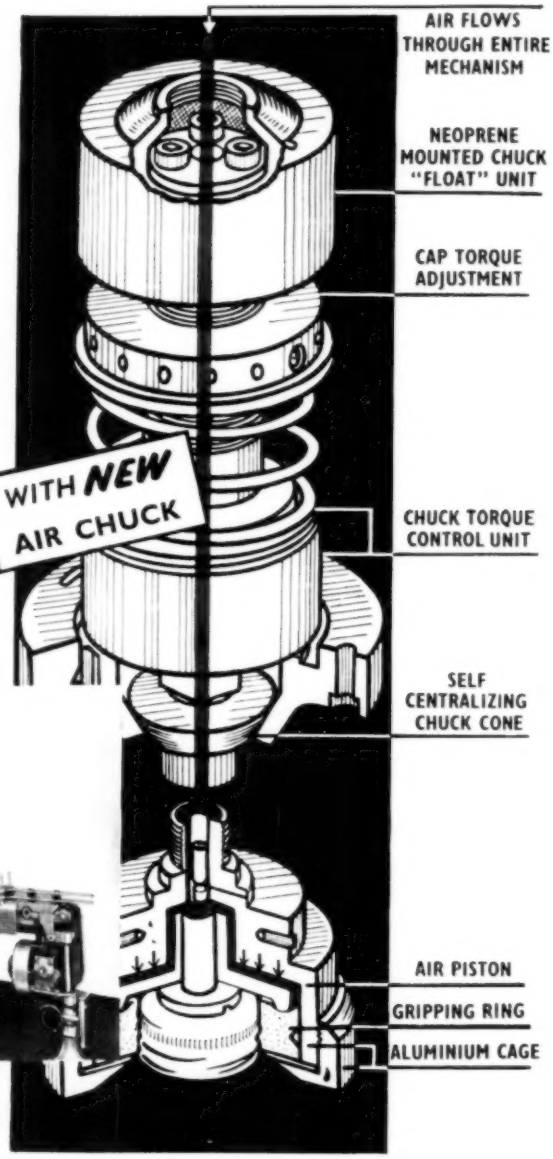
The Pneumacap is available in 4, 6 or 8 head models, each completely automatic and operating with exclusive design air chuck (see diagram). Helical Feed Intake, Individual, synchro or line shaft drive as desired.

SPEED
Up to 240 per minute.

CAPACITY
Max. container dia. 4".
Max. cap size 89 m/m.



Pneumacap 4-head Model.

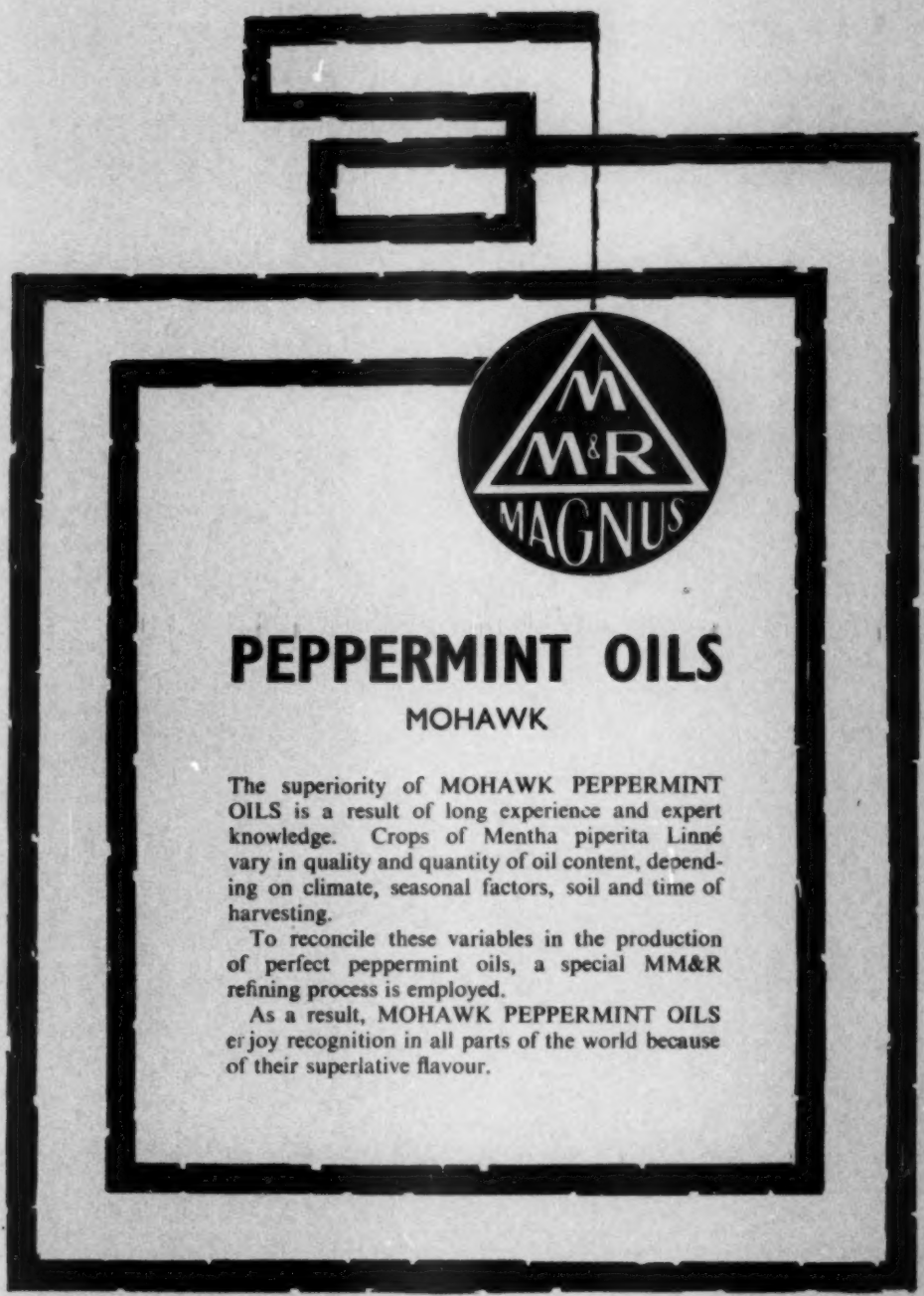


PNEUMATIC SCALE
BRITISH BUILT by **VICKERS**

ROCKWELL PNEUMATIC SCALE LTD

WELSH HARP · EDGWARE ROAD · LONDON N.W.2 · TEL: GLADSTONE 0033

PS PNEUMACAP



PEPPERMINT OILS

MOHAWK

The superiority of MOHAWK PEPPERMINT OILS is a result of long experience and expert knowledge. Crops of Mentha piperita Linné vary in quality and quantity of oil content, depending on climate, seasonal factors, soil and time of harvesting.

To reconcile these variables in the production of perfect peppermint oils, a special MM&R refining process is employed.

As a result, MOHAWK PEPPERMINT OILS enjoy recognition in all parts of the world because of their superlative flavour.

J V D B

Sole U.K. Representatives

JACOBSON VAN DEN BERG & CO. (U.K.) LTD.

International Merchants and Importers and Exporters of Essential Oils since 1861

3-5 CRUTCHED FRIARS, LONDON, E.C.3 ROYal 7664 (5 lines)

MAGNUS, MABEE & REYNARD, INC.

Since 1895 . . . The World's Most Famous Supplier of Essential Oils, Basic Perfume Oils, and Concentrated Flavors

16 DESBROSSES STREET, NEW YORK, 13. NEW YORK. U.S.A.

EXTRACTS

Cascara, Liquorice, Ipecacuanha, Nux Vomica, Opium-liquid, and/or dry, where applicable.

INFUSIONS

Concentrated infusions of Gentian, Orange Peel, Senna, Senega, Valerian.

LINCTUSES

Codeine, Diamorphine, Opiate Linctus of Squill, Pholocodine.

TINCTURES

Belladonna, Benzion, Chloroform and Morphine, Ipecacuanha, Opium, Stramonium.

SYRUPS

Cocillana, Codeine, Compound Syrup of Figs, Easton's, Pholcodine Citrate, Senna, Squill.

T & H SMITH LTD BLANDFIELD CHEMICAL WORKS EDINBURGH 11

VISKRING

the seal of confidence

4 FLUID OUNCES
CALADRYL
CALAMINE AND BENADRYL* LOTION
Soothes and relieves minor skin irritations, insect bites and sunburn.
Contains:
Calamine (U.S.P.), 8%. Benadryl (Diphenhydramine Hydrochloride. P. D. & Co.), 1%. Camphor, 0.1%
SHAKE WELL
and apply as necessary to the affected part.
PARKE, DAVIS
& COMPANY, LIMITED
HOUNSLOW LONDON

'Viskring' and 'Viskap' cellulose bottle closures set the seal on your product—both you and the customer can be confident that the contents reach him in perfect condition. 'Viskrings' and 'Viskaps' protect the contents, prevent adulteration, reduce evaporation and pilferage. What's more, these seals not only are hygienic, they *look* hygienic and, when removed, leave the bottle neck perfectly clean.

Available in many colours, 'Viskrings' and 'Viskaps' can also be printed (in two colours) with your brand name, or trade-mark or advertising message. This ensures instant brand recognition by retailer and consumer and attracts notice where it's most needed —at the point of sale.

- Easily applied by hand—no machinery necessary
- Self-adjusting—require no adhesive
- Non-metallic
- Odourless
- Prevent stoppers riding or blowing

Viscose Development Company Ltd

40 CHANCERY LANE · LONDON · W.C.2

Telephone: CHAncery 8111

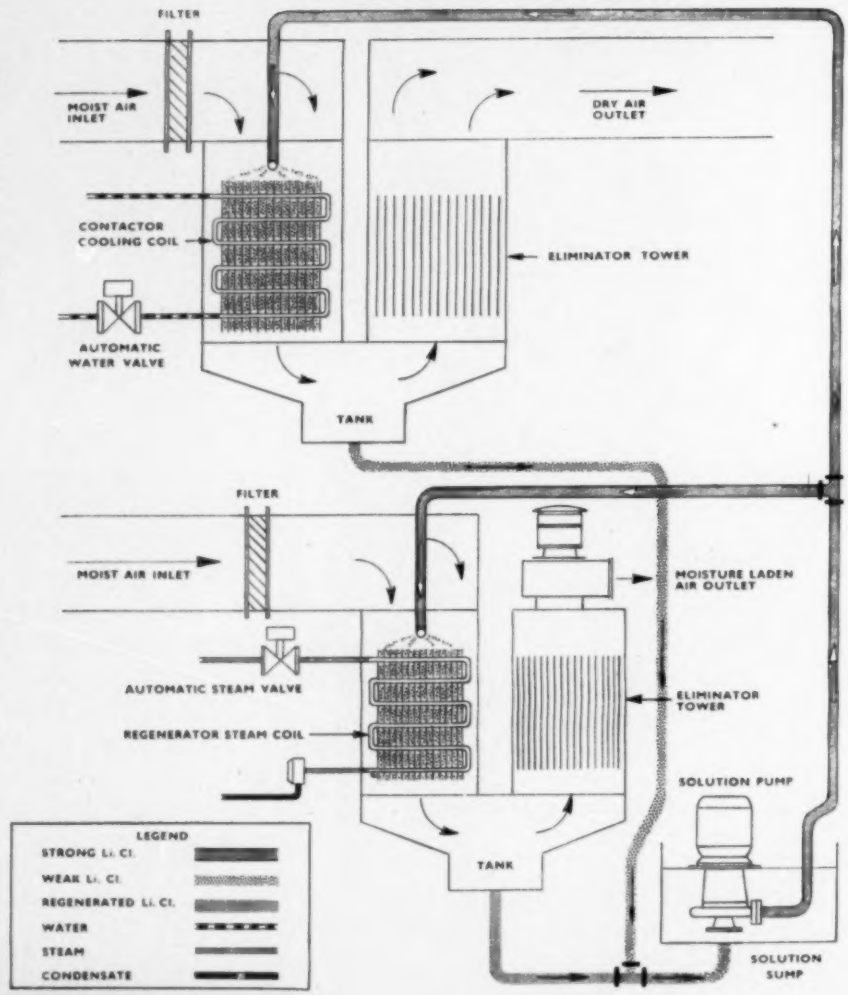
Grams : Viskap, Westcent, London

VC/17

control humidity with

Dehydrair REG'D.

"Dehydrair" dehumidifies moist air in one step, giving constant and automatic control of humidity at low cost, at all times. It has been performance-proved in service, occupies considerably less space than conventional types of plant and has an extremely economical consumption of steam and electricity. We shall be pleased to tell you more about "Dehydrair"—how it can be the vital factor in improving the production or safeguarding the output in factories manufacturing hygroscopic materials, food and pharmaceutical products, photographic films, etc.



This "Dehydrair" installation delivers 1,500 cu. ft. of dry air per minute, and is in use in the packaging department of a well-known pharmaceutical works. All air is passed through a bank of filters prior to entering the plant, and to maintain the required degree of dryness, the drying agent, lithium chloride, is water cooled. The cooling water is pumped through the contactor coil from a tower situated on a flat roof above the installation.

AIR DRYING AND CONDITIONING LTD

14 John Street, London, W.C.1
Telephone: Holborn 4966/8
Works: Wembley, Middlesex

P2593

February Guide to Buyers

BERGAMOT
GERANIUM
YLANG

Excellent reproductions of these oils at attractive prices. Samples and quotations available on request.

★ ★ ★

ARTHOL
TRADE MARK.
LIMITED

★ ★ ★

ESSENTIAL OILS
Natural, Synthetic
& Terpeneless.

PERFUME ESSENCES
for DEODORISERS etc.

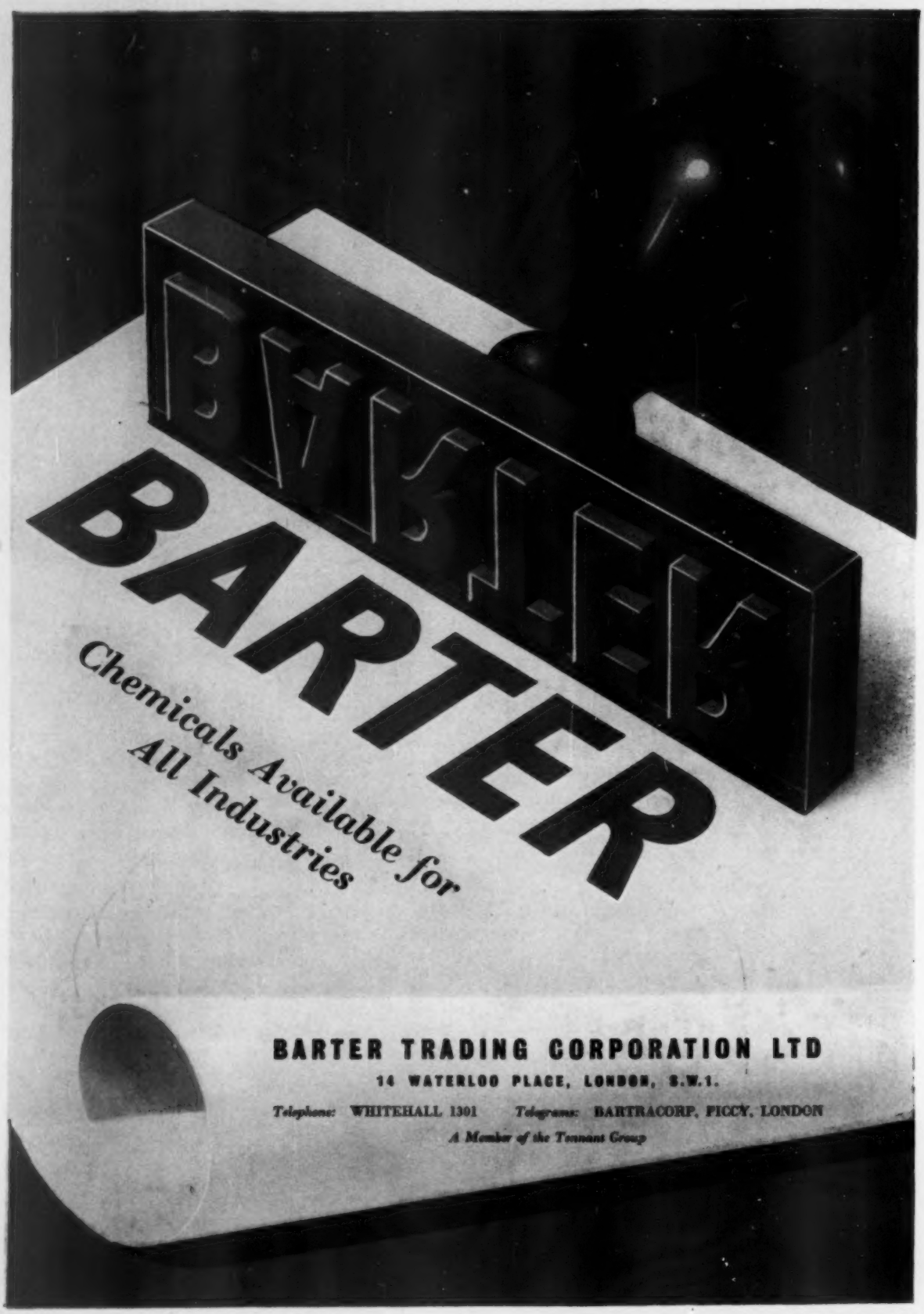
Perfumes

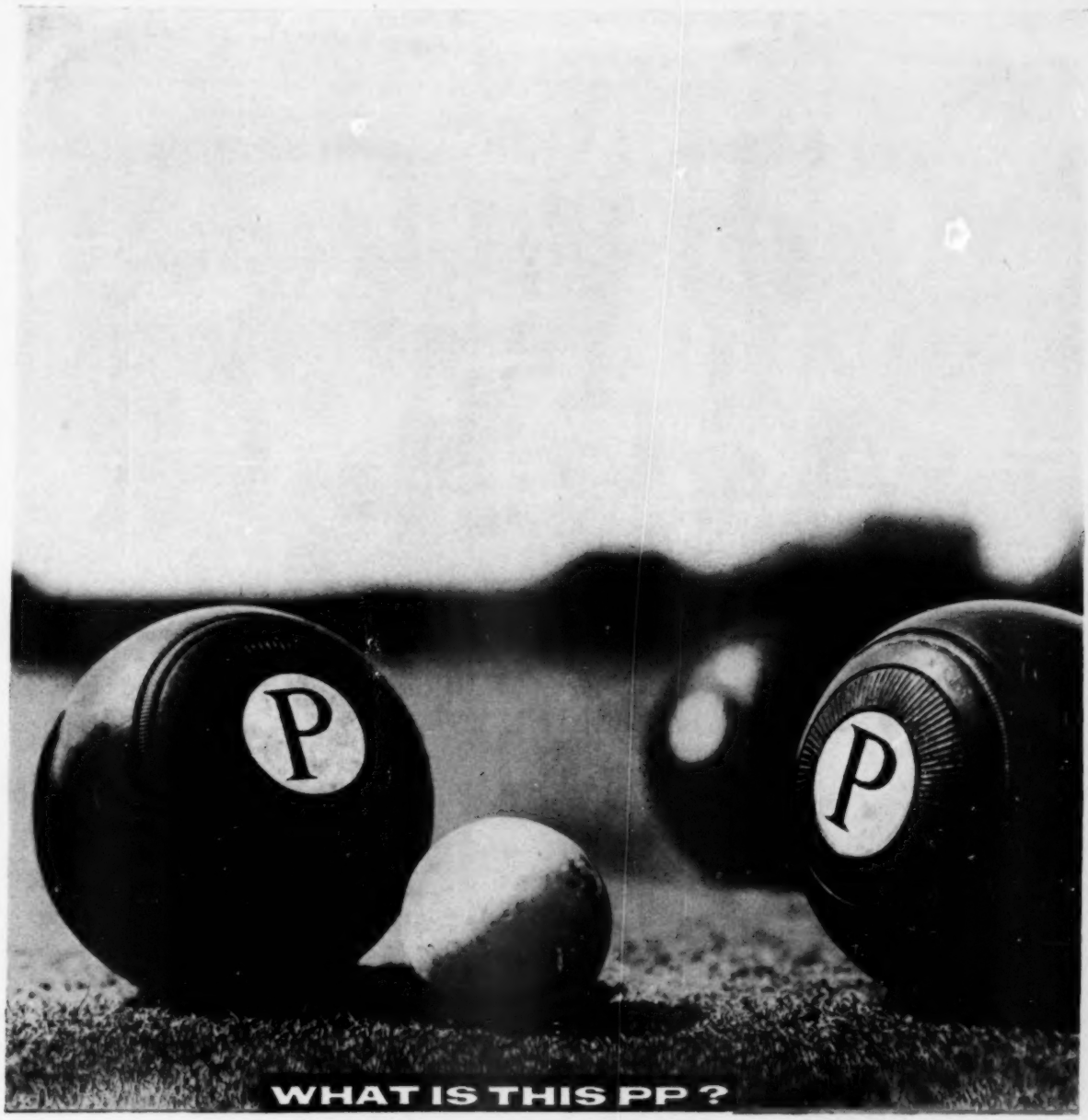
AROMATIC CHEMICALS

TELEGRAMS "SYNTHETICS" CHESTER

SEALAND ROAD
CHESTER

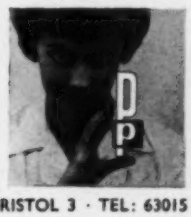
TELEPHONE CHESTER 25664
A.B.C. CODES 5th & 6th EDS


BARTER
Chemicals Available for All Industries
BARTER TRADING CORPORATION LTD
14 WATERLOO PLACE, LONDON, S.W.1.
Telephone: WHITEHALL 1301 Telegrams: BARTRACORP, PICCY, LONDON
A Member of the Tennant Group



It is something nobody can afford to have bias about . . . Progressive Packaging is packaging which never stops—but *never* stops—rolling ahead. However good your pack is today (even if Colodense themselves were responsible) it will be, *must* be, better still tomorrow. For your PP . . .

call in



Colodense

COLODENSE LTD · WEST STREET · BRISTOL 3 · TEL: 63015

Ask Berk

for

Potassium Hydroxide
(All grades)

Sodium Hydroxide
(B.P. and A.R.)

Potassium Carbonate
(All grades)

Potassium Chloride
(95/97% KCl and Chemically Pure)

F. W. BERK & Co., Ltd.,

Berk House, Portman Square, London, W.1
HUNter 6688 (22 lines)

MANCHESTER · GLASGOW · BELFAST · SWANSEA

for ALL ENGINEERING SUPPLIES –

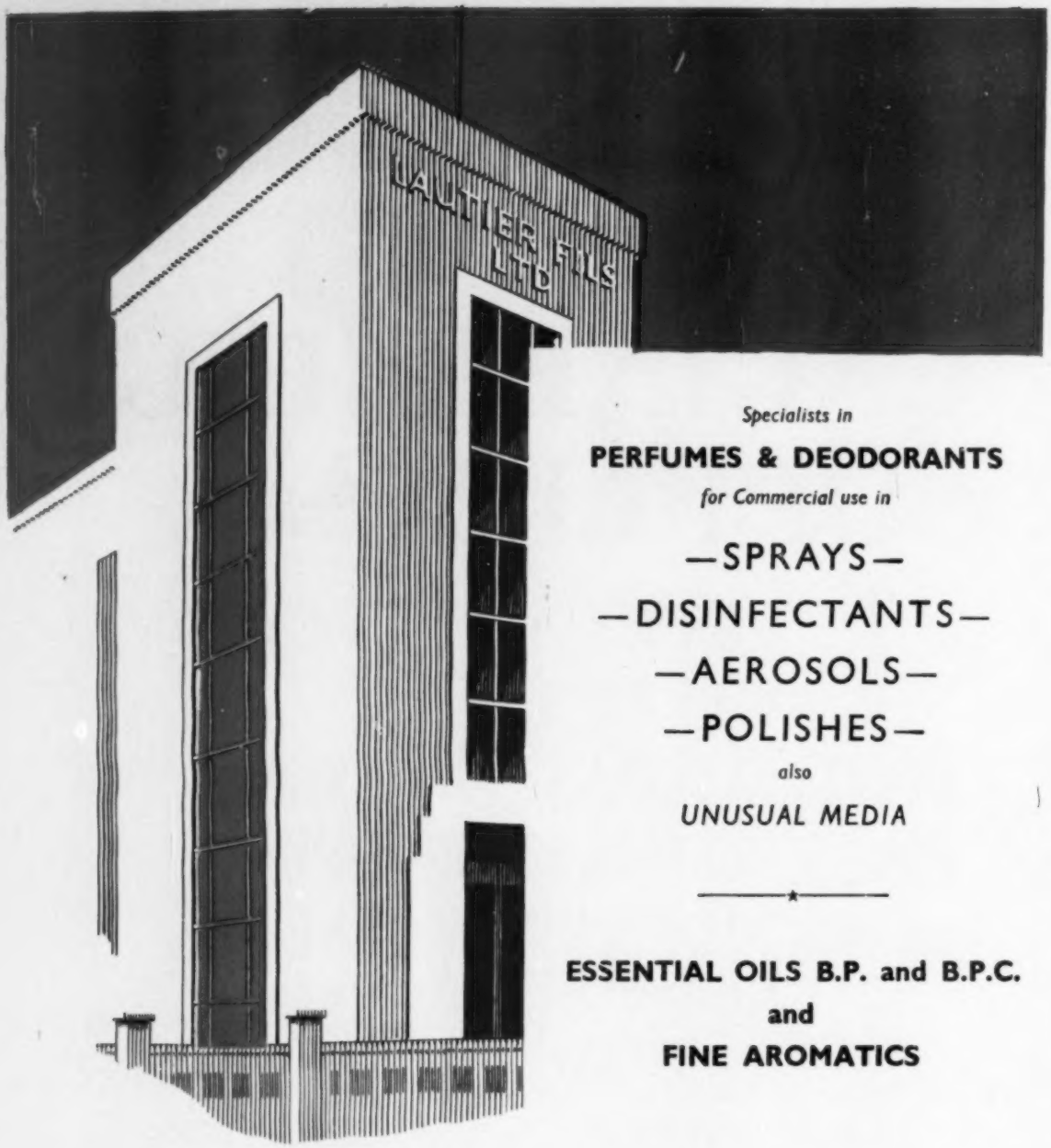
COCKS, VALVES
GAUGES, ETC.
HOP PACKINGS, JOINTINGS
8022 BELTINGS, VEE ROPES
25 lines OILS AND GREASES
HOSES AND FITTINGS
ETC., ETC.

LARGE STOCKS ~ KEEN PRICES

Write or phone

W.H.WILLCOX & CO.LTD.

SOUTHWARK STREET, LONDON, S.E.1



Specialists in

PERFUMES & DEODORANTS

for Commercial use in

—SPRAYS—

—DISINFECTANTS—

—AEROSOLS—

—POLISHES—

also

UNUSUAL MEDIA

ESSENTIAL OILS B.P. and B.P.C.
and
FINE AROMATICS

‹LAUTIER FILS›

LAUTIER FILS LTD · POWER ROAD · LONDON W4 · Telephone: CHIswick 1441

We're old hands at making petroleum sulphonates

sulphonates for emulsifiers 1940

1940 *sulphonates for cutting oils*

sulphonates for anti-corrosive compounds 1940

1941 *sulphonics for fat-splitting agents*

sulphonates for ore flotation 1945

1946 *sulphonates for agricultural sprays*

sulphonates for lub oil additives 1947

1948 *sulphonates for textile processing*

sulphonates for dry cleaning 1952

PETROMOR
BRAND

petroleum sulphonates for industry

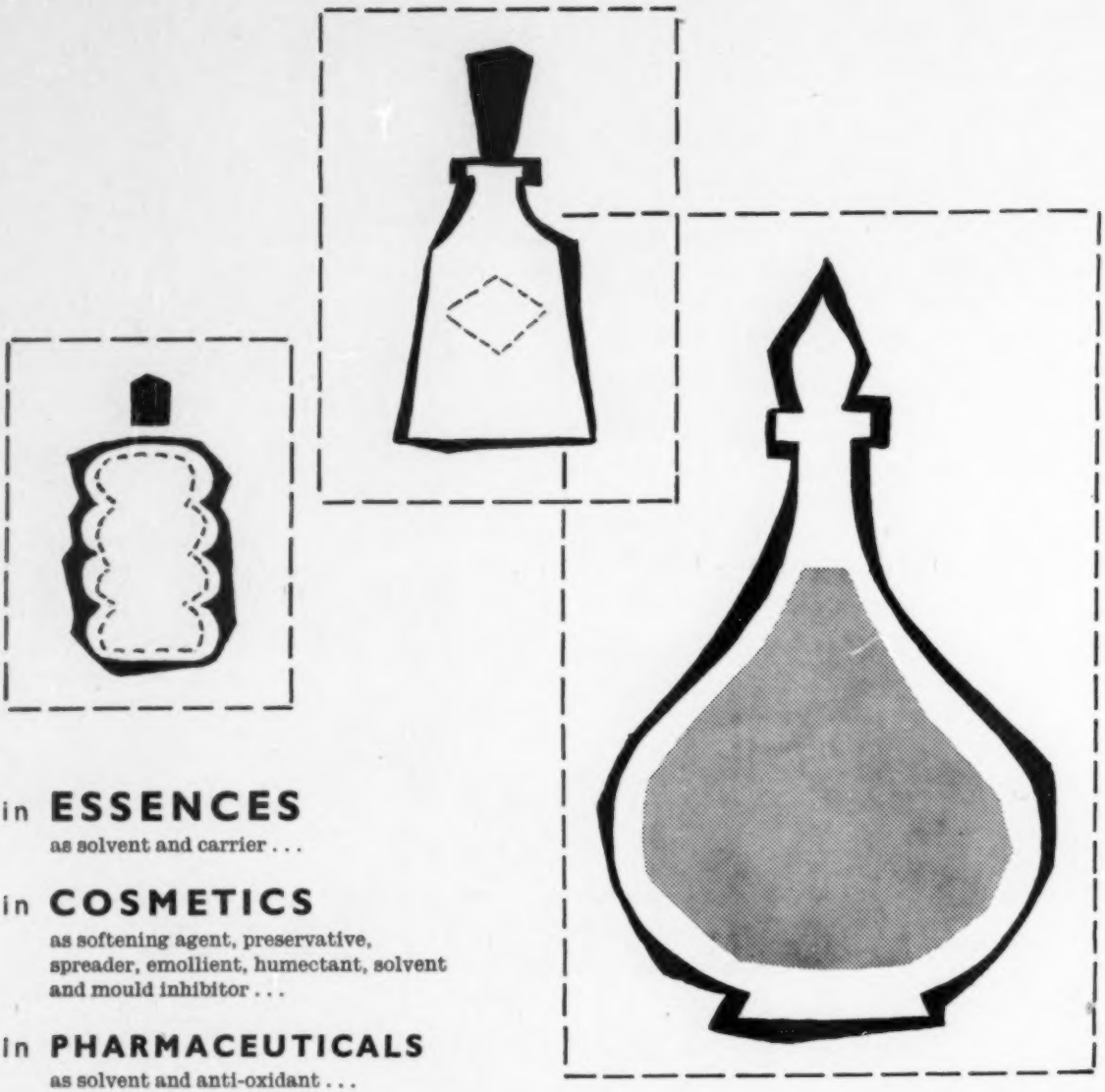
We have been making sulphonates from petroleum for a long time. But experience alone is not enough — we know it must be backed by research and development. As a result of this policy considerable advances in production technique now enable us to offer — for the first time — sulphonates characterised by:

— *continuity of grade*
— *negligible inorganic salt content*
— *low water content*
— *definite molecular weight range*
— *definite concentration.*

For full technical data please write to: **CHEMICAL PRODUCTS DIVISION**

MANCHESTER OIL REFINERY (SALES) LIMITED

76 Jermyn Street · London · S.W.1 · Telephone: Whitehall 8411 · Telegrams: Trafordoil, London, Telex



in **ESSENCES**
as solvent and carrier . . .

in **COSMETICS**
as softening agent, preservative, spreader, emollient, humectant, solvent and mould inhibitor . . .

in **PHARMACEUTICALS**
as solvent and anti-oxidant . . .

PROPYLENE GLYCOL

SHELL CHEMICAL COMPANY LIMITED

In association with Petrochemicals Limited and Styrene Products Limited

Divisional Offices:

LONDON: Norman House, 105-109 Strand, W.C.2. Tel: TEMple Bar 4455. MANCHESTER: 144-6 Deansgate. Tel: Deansgate 2411
BIRMINGHAM: 14-20 Corporation Street, 2. Tel: Midland 6954. GLASGOW: 124 St. Vincent Street, C.2. Tel: Glasgow Central 9561
BELFAST: 16-20 Rosemary Street. Tel: Belfast 26094. DUBLIN: 33-34 Westmoreland Street. Tel: Dublin 72114

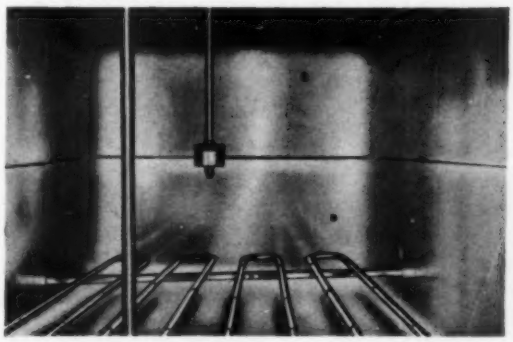
SHELL

PGD/1

AVAILABLE IN B.P.C. AND U.S.P. GRADES FROM U.K. PRODUCTION

I'm all mixed Up...!

. . . ARE YOU?



About mixing? How to achieve the best results most economically – What type to buy, what size, materials of construction and so on.
Aiton engineers can offer you a complete range of designs to satisfy every fluid mixing process. They choose the type, the size, the speed and the constructional materials.

Aiton P.W.V. mixers are designed and made to high engineering standards, dynamically balanced to give long life and maximum conversion of electrical energy to mechanical energy.

AITON

PWV MIXERS

FOR SMOOTH LOW-COST MIXING

AITON & COMPANY LIMITED, DERBY
Tel.: DERBY 4711

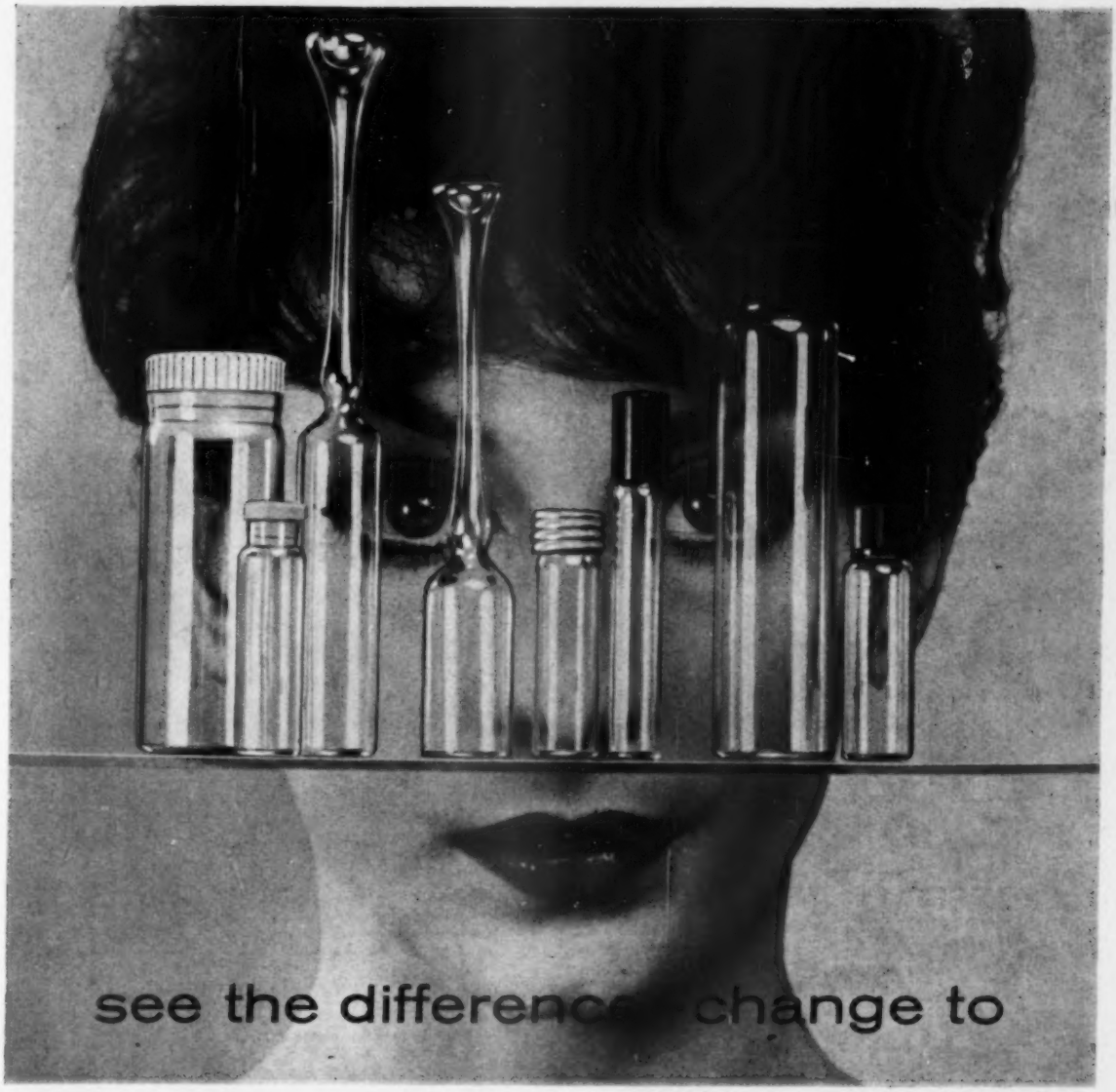
New and Interesting Classes of AMPHOLYTIC Surface Active Agents

. . . combining the properties of anionics and cationics for the

formulation of **GERMICIDES / DETERGENTS / SANITISERS / PHARMACEUTICAL PREPARATIONS**

Samples available for evaluation

WORTLEY LOW MILLS, LEEDS 12. Tel : LEEDS 63-7847/8/9 Grams : "GLOKEM Leeds"



TRIDENT
TUBULAR GLASS CONTAINERS

The noticeable thing about Trident tubular glass containers is the clarity of the glass. It has superb brilliance. That's because Trident tubes, vials and ampoules are drawn from bright, clear tubing enhancing the products on view and giving a different, more expensive look to them. We have a wide range of standard sizes, shapes and closures, at prices competitive with other kinds of containers, and we can supply almost any special size required at no great extra expense.

A further sound reason for changing to Trident tubular glass containers is the saving in packing and freight charges. They occupy a minimum of packing space and, because of their lightness in weight, freight charges are quite considerably reduced.

If you are planning a new product or giving new life to an old one, we would like to help you. Ask for our new catalogue.

Johnsen & Jorgensen Ltd.
Trident Glass Works,
Herringham Road, Charlton,
London, S.E.7.
Telephone: Greenwich 0151 (5 lines)

See our exhibit at The Packaging Centre, Poland Street, London, W.1.

3458

LET Clarifoil BE YOUR SHOP-WINDOW

Laminates for sachets, window-cartons for stockings and braces, transparent rigid packs for handkerchiefs, blister packs for razors . . . wherever or however crystal-clear Clarifoil is used, it builds its own shop-window round the products. Proved as a sales winner second to none, Clarifoil gives visibility, impact, dominance, and is printable in multi-colours. Pack in tough, water-resistant, flexible Clarifoil to sell, and sell quickly!

Blister Pack by Omega Plastics Ltd.
Sachets by Robinson Waxed Paper Co. Ltd.
Visual Containers by Hargill Ltd. and
Visual Container Co. Ltd.
Window-cartons by J. Dring Ltd. and
E. S. & A. Robinson Ltd.

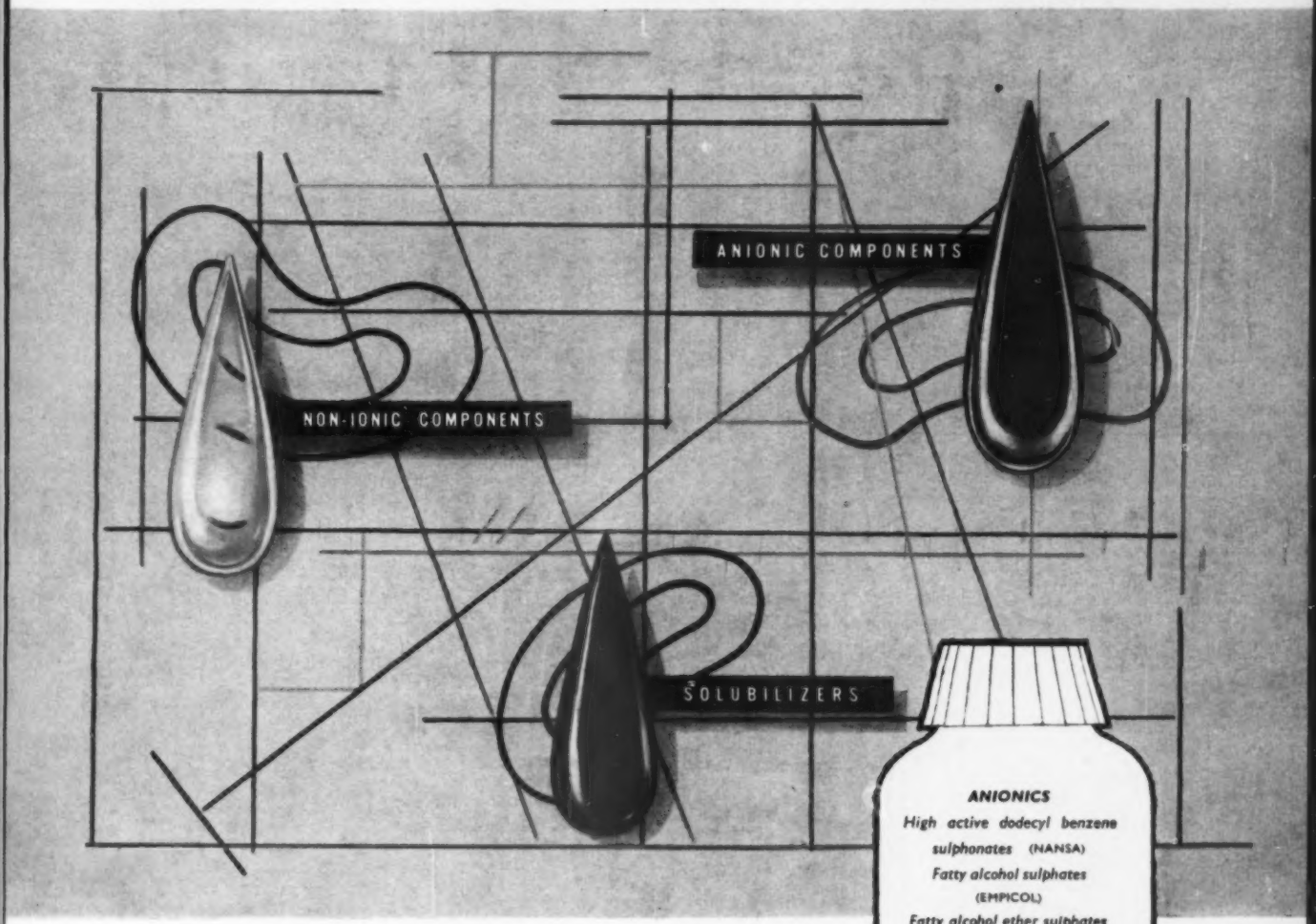
✳ *The Celanese Technical Sales Service, with its unrivalled experience, is freely available to help solve your packaging problems. Write to Department* M.C.6.

Clarifoil TRADE MARK TRANSPARENT ACETATE FILM *sells on sight!*

Plastics Division · British Celanese Limited · Hanover Square · London W.1 · MAYfair 8000

CPS.10.

Anionics **Non-ionics** **Solubilizers**



ANIONICS

High active dodecyl benzene sulphonates (NANSA)

Fatty alcohol sulphates (EMPICOL)

Fatty alcohol ether sulphates (EMPICOL)

NON-IONICS

Fatty acid mono- and dialkylo-amides (EMPILAN)

Polyethanoxy ethers of fatty acid monoalkylolamides (EMPILAN)

Other ethylene oxide derivatives

SOLUBILIZERS

Substituted aromatic sulphonates (sodium and potassium xylene and toluene sulphonates) (ELTESOL)

for competitive LIQUID detergents

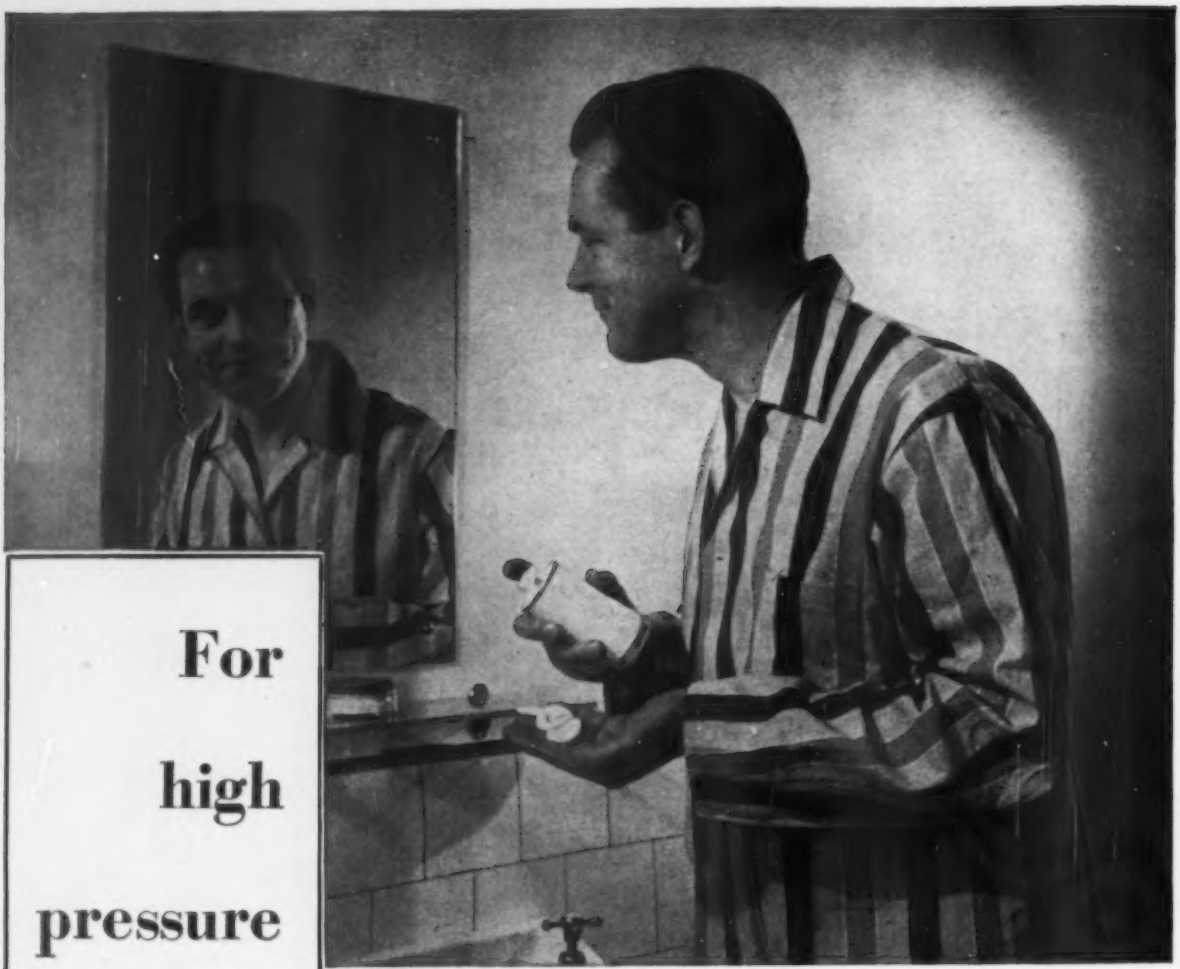
For dishes . . . fine fabrics . . . hard-surface cleaning . . . the increased popularity of liquid detergents has led to keen competition, with selective formulation a key factor in winning consumer approval.

The Marchon range of components for 'liquids' gives you the choice of many formulations, each with distinct advantages in a particular field, one or more meeting *all* your requirements. Please write for technical data, with formulation advice if required.

AGENTS & OFFICES IN PRINCIPAL CITIES OF THE WORLD
HEAD OFFICE: Whitehaven, England.
Telephone: Whitehaven 3131; Telegrams: Marchonpro, Whitehaven, Telex
LONDON OFFICE: 140 Park Lane, London, W.1.
Telephone: Mayfair 7385; Telegrams: Marchonpro, London, Telex
Member of the Albright & Wilson Group of Companies

Marchon
PRODUCTS LIMITED

Marchon's products include basic raw materials and additives for every form of domestic and industrial detergent.
MAR 11098



For high pressure sales

in low pressure aerosols

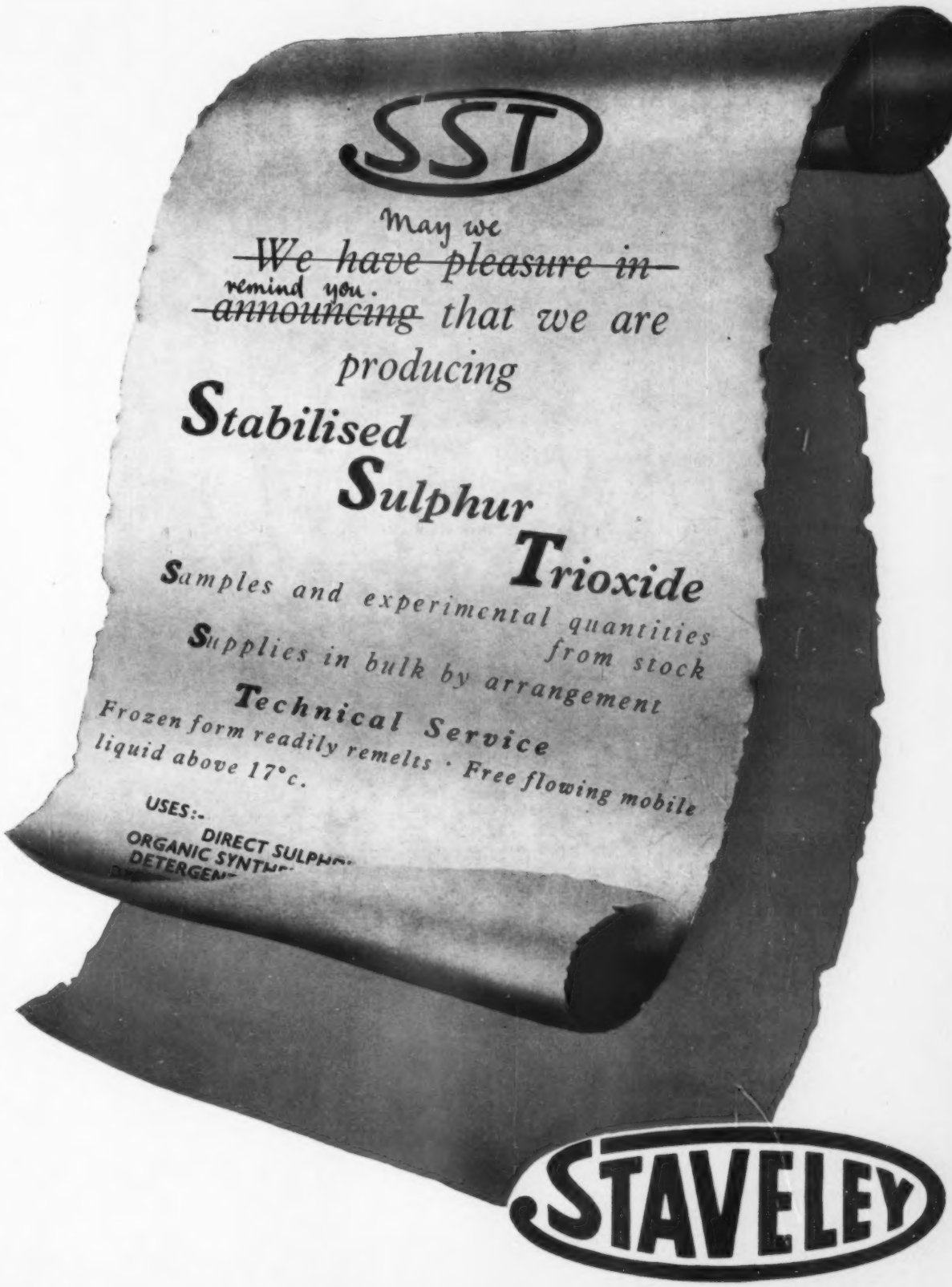
use **'ARCTON'** propellents

'Arcton' 6, 'Arcton' 9 and 'Arcton' 33—also mixtures of 'Arcton' 6 with 'Arcton' 9 or 'Arcton' 33—the non-toxic, non-inflammable aerosol propellents, are available.

ICI

AR36

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1



THE STAVELEY IRON & CHEMICAL CO. LTD. NR. CHESTERFIELD

He took it to his heart!

PRODUCTS OF ORGANIC AND INORGANIC CHEMISTRY
TAR DYESTUFFS
CERAMIC GLAZES AND FRITTES
PLASTIC RAW MATERIALS
TEXTILE CHEMICALS
FINE CHEMICALS
PHARMACEUTICAL INTERMEDIATES AND SPECIALITIES

All that is supplied by

CHEMAPOL

PRAHA · CZECHOSLOVAKIA

WELL-GROOMED . . .

attractive tubes, go far to selling a product. John Dale collapsible tubes are famous and contain famous products. If it's tubes you want, contact

JOHN DALE LTD

New Southgate, London N.11
Telephone Enterprise 1972
Pitsmoor Works, Bury, Lancs
Telephone Bury 5295

AAIID

REODORIZE

your products and give them

that extra, universal appeal with

'PLANAROME'

trade mark *brand*

COMPOUNDS

'Planarome' compounds are of particular use in the manufacture of adhesives, aerosols, deodorant blocks, disinfectants, inks, paints, perfumed sprays, plastics and rubber.

Samples and further information will be supplied on request

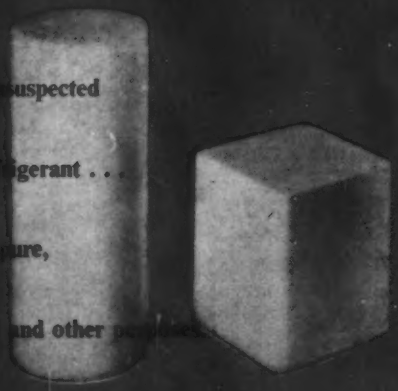
M&B
brand

AROMATIC COMPOUNDS

MANUFACTURED BY

MAY & BAKER LTD

DAGENHAM · TELEPHONE: DOMinion 3060 · EXTENSION: 355



'Drikold'

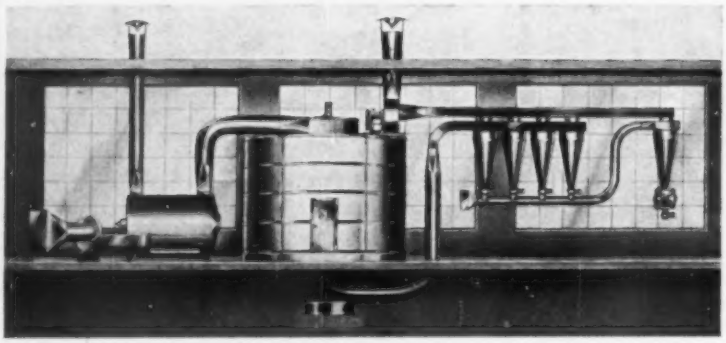
serves the chemical industry

Imperial Chemical Industries Ltd., London, S.W.1.

Choose the best in use

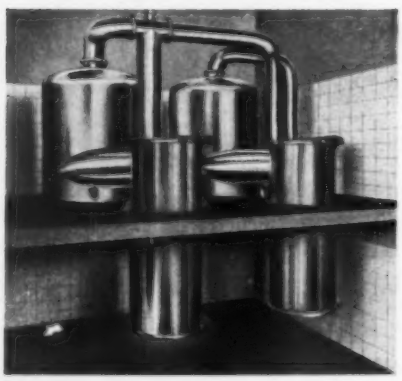
ANHYDRO

Spray Dryers *and* Evaporators



All over the world ANHYDRO is known for the highest quality and the greatest advantages. And no wonder, for ANHYDRO is far cheaper in operation and maintenance—gives the greatest reliability—improves the quality of the powder—and takes up less space.

. . . the modern system with the multiple advantages



ANHYDRO

in use all over the world . . . .

ANHYDRO A/S, 36 Nørregade, Copenhagen K, Denmark

Cable Address: Anhydro. Telephone: MI. 4767

Versatile Poly-Tainers
do all these jobs—cheaply and well!

The flexibility of Poly-Tainers makes it possible to use them with a variety of simple, inexpensive fitments to spray, puff, pour or otherwise dispense many different products. Add to this the other advantages of Poly-Tainers: they are light, virtually unbreakable and can be custom-moulded to almost any shape and in many colours. There is also a wide range of stock moulds to choose from, and bottles from these moulds can be printed or embossed.

Custom-made Poly-Tainers are not expensive, especially for long runs. Alternatively stock bottles from ¼ fl. oz. to one gallon are available plain or printed, and some can even be custom embossed. Ask for the Poly-Tainer booklet NOW!

MB Poly-Tainer Regd

METAL BOX PLASTICS

The Plastics Group of
The Metal Box Company Ltd
37 Baker Street, London, W.1
Telephone: **Hunter 5577**

Poly-Tainers are helping to sell these, and many others—

Cosmetic and Toilet Preparations
HAIR LACQUERS AND SPRAYS
DEODORANT SPRAYS
AFTER SHAVE LOTIONS
TALCUM AND DUSTING POWDERS
LIQUID MAKE-UP
HAND CREAMS AND LOTIONS
COLOGNES
PERMANENT WAVING LOTIONS
SUN TAN OILS
CLEANSING AND OTHER SKIN LOTIONS

Pharmaceutical Products
NASAL SPRAYS
EYE DROPS
POWDERS

Household Products
GLUES, ADHESIVES
DISINFECTANTS
FLY SPRAYS, INSECTICIDES
RUST REMOVERS
CLEANING PRODUCTS AND DETERGENTS

Chemicals
ACIDS AND OTHER INDUSTRIAL LIQUIDS

Foodstuffs
Poly-Tainers are suitable for many foodstuffs. Please consult Metal Box about food packaging in Poly-Tainers.

55/05

QUALITY IN

RECTANGULAR TABLET BOTTLES

First Class in GLASS

NATIONAL GLASS WORKS (YORK) LTD.

FISHERGATE, YORK. Tel. YORK 23021

ALSO AT 105 HATTON GARDEN, LONDON, E.C.1

Tel. HOLBORN 2146

PROMPT DELIVERY FROM STOCK

Packed in easily handled cartons

WHOLESALE ONLY

STURGE means fine chemicals

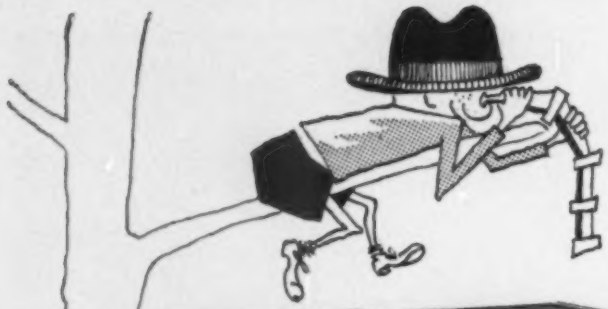
Since 1823, John & E. Sturge Limited have produced fine chemicals for industry. The quality and consistency of these basic Sturge chemicals help to ensure high standards in end-products as diverse as toothpaste and paint.

JOHN & E. STURGE LTD

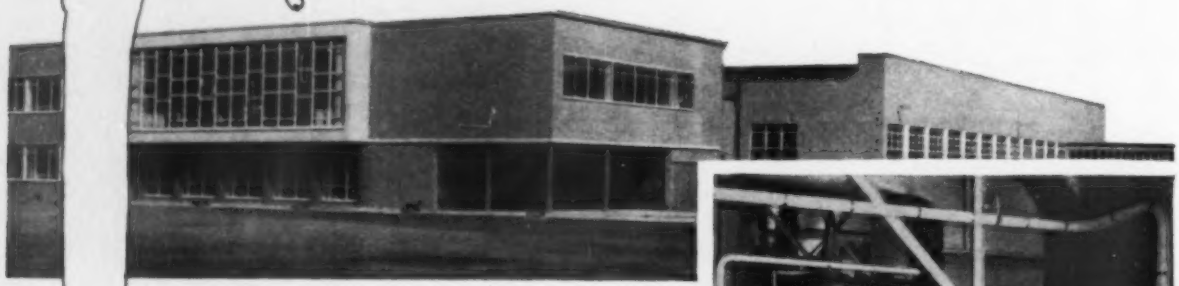
WHEELEYS ROAD, BIRMINGHAM 15

TELEPHONE: MIDLAND 1236

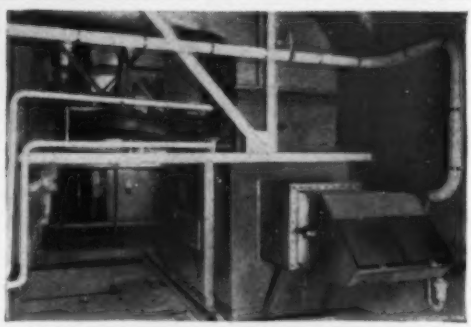
AN INDEPENDENT COMPANY
MANUFACTURING FINE CHEMICALS SINCE 1823.



With an eye to Asepsis



Creating the right atmosphere for antibiotics



At Gosport where Aureomycin is produced by Cyanamid's Lederle Laboratory Division, Birlec has installed the British pharmaceutical industry's largest and most advanced plant for low humidity air conditioning. This huge installation comprises four Birlec direct dehumidifiers serving the entire sterile (right, centre) tabletting and encapsulation (right, lower) departments—a total of some 20 rooms.

BIRLEC DIRECT DEHUMIDIFIERS FOR AIR CONDITIONING

Dryer Division of

BIRLEC LIMITED *An A.E.I. Company*

ERDINGTON • BIRMINGHAM 24

LONDON · SHEFFIELD · GLASGOW · NEWCASTLE-UPON-TYNE · JOHANNESBURG

BM/B.3841

Ensures

Ultra

Clean

Air Conditions

for the manufacture and processing of proprietory foods pharmaceuticals fine chemicals and cosmetic preparations

It removes all particulate matter, dust, smoke, pollen, bacteria, etc., down to less than ·01 micron from Heating, Ventilating, Air Conditioning, and other air supply plants.

It has a constant high filtration efficiency and a constant low resistance. Maintenance costs are negligible.

Electrostatic Air Cleaning was pioneered by Sturtevant in the United Kingdom with PRECIPITRON.

For further particulars write for a copy of the **third edition of our publication V/7106.**

STURTEVANT

ENGINEERING CO. LTD.

Southern House, Cannon Street, London, E.C.4.

AUSTRALIA

Sturtevant Engineering Co. (Australasia) Ltd.
400 Sussex Street, Sydney, N.S.W.

Manufacturing Chemist

Vol. XXX, No. 2 FEBRUARY, 1959

Topics and Comments:
"Which" hunt ? Fire in the lab; Cosmetics older women need; Uncompromising and illogical; Haphazard quality control; Purity can kill perfumes; Forty revolutionary years; Arsenic, tobacco and cancer. 49

A Guide to African Rauwolfia 53
By W. E. Court, M.PHARM., F.P.S., *and G. E. Trease*, B.PHARM., D.DE.L'U., F.P.S., F.R.I.C.

Seven Methods of Determining the Active Constituent of MCPA Weedkillers 57
By L. A. Haddock, R. Hill and A. G. Jones

FIRE PREVENTION AND FIRE FIGHTING

How to Prevent Fires in Chemical Works 61
By F. E. T. Kingman, PH.D., F.R.I.C.

Equipment for Preventing and Fighting Fires 64

Non-irritant Depilatories 68
By T.A. Ruemele, PH.D.

New Laboratories in Edinburgh 68

Perfumer's Odyssey—Essential Oils of the Belgian Congo—2 69
By Steffen Arctander

Progress Reports

Disinfectants and Disinfection 73
By A. H. Walters, F.I.M.L.T., M.R.S.H., M.I.BIOL.

Pest Control Chemicals 76
By D. P. Hopkins, B.SC., F.R.I.C.

New Facilities for Making Ointments 80

REGULAR FEATURES: INDUSTRY'S PUBLICATIONS 79 BOOK REVIEWS 81 • PLANT AND EQUIPMENT 84 • NOTES AND NOTIONS 86 • NEWS 87 • PEOPLE 90 • MEETINGS 91 NEWS FROM ABROAD 92 • NEW PRODUCTS 93 • NEW COMPANIES 93 • THE CHEMICAL MARKET 94 • NEW PATENTS 96 • NEW TRADE MARKS 96 • SIXTY FIVE YEARS AGO 96

Subscription Rates: One Year £2; Three Years £5.
Dollar Rates $12 and $30.

© LEONARD HILL LIMITED

A Publication of the Leonard Hill Technical Group—ENGLAND: Leonard Hill House, Eden Street, London, N.W.1 (Euston 5911).

U.S.A.: 1214 Villa Drive, N.E. Atlanta, Georgia; 2515 Beverly Blvd., Los Angeles 57, Calif. (Dunkirk 1-2241); 121 Ward Parkway, Kansas City, 12. Mo.; Room 5632, Grand Central Terminal, New York 17, N.Y. (Murray Hill 9-5532); 681 Market Street, San Francisco 5, California (Exbrook 2-2612); 222 N. Wells St., Chicago, Illinois (State 2-5251); 1900 Euclid Bldg., Room 225, Cleveland 5, Ohio (Cherry 1-7565); ITALY: Via Filippo Turati 3 (Palazzo Giardino), Milan; SWITZERLAND: Sulgenbachstrasse 36, Berne; FRANCE: 63 Avenue Kleber, Paris XVI^{e} (Passy 31-30); SWEDEN: Tunnelgate 19B, Stockholm; DENMARK: Palaegade 7, 3 Sal. Copenhagen K.

ANNOUNCEMENT...

Announcement is made that Van Ameringen-Haebler, Inc. of New York, and Polak & Schwarz N.V. of Zaandam, Holland, have combined their interests and will operate as divisions of a new company, to be known as

INTERNATIONAL FLAVORS & FRAGRANCES INC.

The identities of these two long-established firms will be retained and each will continue to serve its customers in the same manner as in the past.

By operating in conjunction with each other, they will have development, manufacturing and distributional facilities in fifteen countries, through wholly-owned subsidiaries in North and South America. Europe, Indonesia and South Africa.

As a result both firms will be able to supply their products and services on a greatly expanded and more effective basis.

VAN AMERINGEN-HAEBLER
Division of International Flavors & Fragrances Inc. 521 West 57th St., New York 19. N.Y.

POLAK & SCHWARZ INTERNATIONAL N.V.
Division of International Flavors and Fragrances Inc. Zaandam – Holland.

Creators and Manufacturers of Flavours, Fragrances and Aromatic Chemicals.

POLAK & SCHWARZ (ENGLAND), LIMITED,
50 Great Cambridge Road, Enfield, Middlesex. *Telephone: ENFIELD 6781/2/3/4.*

TOPICS AND COMMENTS

"Which" hunt?

CHEMICAL products are coming in for plenty of attention from the two consumer advisory organisations which publish assessments of quality and price in their quarterly journals. Consumers' Association Ltd. publish *Which* and in the last two issues they have examined—besides oil heaters, sheets, toasters and hire purchase—toothpastes, glucose drinks, slimming cures, chemistry sets, compound aspirins and protein foods. The Consumer Advisory Council of the British Standards Institution, in the winter issue of their *Shopper's Guide*, report on silicone furniture polish, nail varnish, toilet soap and baking powders.

Of the two, *Which* is perhaps the more forthright and price conscious, but there is little between the two magazines. *Which* specialises in tables setting out the composition, weight and price per unit of products and does not shrink from branding a product as "not recommended" if it thinks fit.

In the case of aspirin it gives no more information about composition than is printed on the packs and probably leaves most people just as wise and just as convinced in their own mind of what suits them best. Would a person who usually buys *Veganin* at 1s. 11½d. for 20 tablets switch to Compound tablets of Codeine B.P. because he reads that the latter costs only 7d. for 20?

Similarly, will the comparison of toothpastes, which shows a variation of between 1s. 7d. and 2s. 2d. per 50 g., cause devotees of *Macleans* to change to, say, *Euthymol*? Bearing in mind *Which's* advice to choose a toothpaste "whose flavour and texture you like best," we think not.

However, the reaction of the reader may be very different when she learns from *Shopper's Guide* that one nail varnish (Rubinstein's) costs 17s. 1d. per fl. oz. against 6s. 3d. for another (*Cutex*), particularly when she is told that tests for hardness, wearing strength, resistance to detergents and so on showed that the dearest is not the best. Even allowing for differences in packaging, shine and range of colours it seems difficult to justify such a large price difference.

The article on toilet soap waspishly deflates the (admittedly) absurd claims of some brands to make the skin "younger, softer and lovelier than ever," and then gives sensible advice: rather than being impressed by such phrases as super-fatted "it is more important to study the free alkali figure which tells how well the soapmaker has got rid of traces of alkali." All 13 soaps examined passed this test well. Here again there are remarkable variations in price—from 6d. per 100 g. for Boots' Lilac (an unwrapped soap) to 8s. 4d. for the luxury of Yardley's *Lavender*. Yardley's is well over twice the price of any other soap examined and it shows what can be done by the skilful exploitation of a famous name. However, the article concedes that perfume can easily and justifiably double the price of a tablet of soap and leaves it to the purchaser to decide what she will pay for a soap that smells wonderful.

Unwelcome as these advisory bodies may be to some manufacturers, they are gaining a lot of public support and it would be foolish to dismiss them as passing fads. More than ever people are demanding quality and value for money, and it would not be a bad thing if some manufacturers performed an "agonising reappraisal" of their products, prices and advertising claims.

Fire in the lab

IN THIS issue Dr. F. E. T. Kingman of the Fire Research Station gives admirable advice to chemical manufacturers on how they can prevent the disaster of fire in their factories. He emphasises that fire prevention should not be a hasty and improvised reaction to an emergency but an integral part of normal operating routine. Some of the equipment for fire prevention which is now at the disposal of industry is described in the review which follows Dr. Kingman's article.

The same fire precautions which are taken in the factory should be carried out in the chemical laboratory where flammable liquids, exothermic reactions, flames from bunsen burners and other heating plant and electrical equipment may all cause fire. Spilled liquids and escaping vapours can spread the fire rapidly and disastrously.

In a recent issue of the *F.P.A. Journal*, the Fire Protection Association outline elementary precautions. The amount of flammable liquids and dangerous chemicals kept in the laboratory should be kept small; if possible there should be a separate building for bulk storage of hazardous materials.

There should be at least one door at each end of the laboratory and all doors should open outwards to make escape easier should fire occur. If the roof of the laboratory is constructed of light non-combustible material which is easily shattered it will help to minimise the effect of an explosion.

It is most important that the laboratory should be well laid out. Congested and badly arranged surroundings make accidents more likely, so there should be plenty of space between benches giving workers ample room to move about.

The position of benches in relation to windows should be carefully selected: it is difficult to see an aerated bunsen burner flame in sunlight and globu-

lar flasks can act as lenses, so concentrating the sun's rays and forming a possible source of ignition.

Benches should not be so wide that workers have difficulty in reaching across them to articles at the back and they should allow easy access to gas taps. The best place for gas is under the front edge of the bench with the connection for tubing at the back of the bench. Open drainage gullies at the back of or between benches should only be used for draining away water and not for the disposal of flammable liquids or solids.

Electrical installations should be made in accordance with the regulations of the Institution of Electrical Engineers for the Electrical Equipment of Buildings. If a laboratory is part of a factory or can be classed in itself as a factory under the Acts, the Factories Acts of 1937 and 1944 and the Electricity (Factories Act) Special Regulations, 1908 and 1944, will be applicable. Electric points should be placed so that the minimum of flexible wire is used between the point and the apparatus.

Hot plates, furnaces and ovens should stand on a heat-resisting base. Where the base is on a bench, there should be an airspace between the base and the bench, to prevent the charring of wooden bench tops. Gas jets not in use should be turned off or adjusted to give a small luminous flame. The recommended air flow through the face of fume cupboards is 100 linear ft. per min. and when toxic materials are being used the air flow should be not less than 150 linear ft. per min. The water flow through condensers should be adequate and constant, and care should be taken to see that no faulty rubber tubing is used. Where smoking is allowed proper receptacles should be provided for cigarette ends and matches.

Because of the variety of materials and equipment which may be encountered in a laboratory it is not possible to lay down hard-and-fast rules for the most suitable fire extinguishing appliances; each laboratory must be considered separately. As carbon dioxide, dry powder (gas pressure), carbon tetrachloride and chlorobromomethane extinguishers are suitable for dealing with fires in both flammable liquids and electrical equipment one of these types may be suitable in many cases. It should be remembered, however, that the halogen compounds are toxic and should not be used where there is any risk of their vapours being inhaled. Where there are large quantities of flammable liquids, foam extinguishers should be available. Fire blankets should be provided for extinguishing burning clothing. Buckets of sand should also be available. Fire should be attacked at once and the fire brigade called. All staff should know how to call the fire brigade and notices explaining the correct method of calling the brigade should be prominently displayed. In case of serious danger adequate escape arrangements are necessary. There should be at least one door at each end of the laboratory and all doors should open outwards to make escape easier.

Cosmetics older women need

Do cosmetic manufacturers pay too little regard to the special needs of older women? The implication that this is, in fact, the case, even in the United States, was made by Dr. Alice E. Palmer, a dermatologist, when she spoke recently at a meeting of the Society of Cosmetic Chemists of America held in New York.

Dr. Palmer listed some of the cosmetics she would like to see developed for older women. It seems that a series of antiperspirants are needed for different parts of the body. Sweat from the face, hands, feet and underarm differs considerably and anti-perspirant cosmetics should be formulated with these differences in mind. Mildly keratolytic preparations are needed for regular attention to the skin of the feet. Cosmetics for regular use to protect against actinic radiation are needed. New agents are required to protect the skin against the heavily degreasing action of modern household chemicals. New thought should be given to non-irritant bleaching preparations for use on the skin, based on a knowledge of different types of hyperpigmentation.

In spite of the progress made in shampoo formulation, Dr. Palmer (whose paper is printed in the *Journal* of the Society of Cosmetic Chemists, 1958, 9 (6), 336-48) thinks that new shampoos are needed; for instance, one that when it removes oil from the hair does not stimulate even greater oil production.

Another group of preparations are required for application to natural skin folds and to skin surfaces in apposition. Non-skid bath preparations are needed for older women who are no longer agile enough to feel safe in the bathtub.

A "desperate need," according to Dr. Palmer, is a substance to protect the face and neck during hair drying. In her view the blast of hot air over the cheek and sides of the neck can prematurely age the skin.

In general, Dr. Palmer suggested that the head and hands have received too much attention from the cosmetic industry in proportion to the rest of the body. More should be done for the feet; not just for toe nails, but skin and nail care. Protectives are needed for the ankles and heels—softeners, keratolytics and moisturisers. Cutaneous problems develop in the legs because of the inadequate protection offered by thin stockings, combined with the vascular compression of garters and girdles.

As a dermatologist who is consulted every day by women with skin problems, Dr. Palmer is in an unusually good position to speak with authority on the shortcomings of modern cosmetics. If older women are properly catered for by the cosmetic industry they can provide as big a market for cosmetics as the under-thirties. Beauty is far more than make-up. Cosmetics can help to arrest the ageing process by making women feel happier, healthier and more comfortable.

Uncompromising and illogical

ONE'S respect for the sincerity of the antivivisectionists is always mingled with astonishment at their inconsistency. Reading the latest pamphlets from the British Union for the Abolition of Vivisection, one is struck by the utter absence of the smallest admission that animal experiments advance medicine. Details of experiments are given in the most gruesome detail and any and every drug that has resulted from biological experiment is belittled. Even insulin is condemned as a no-cure. Whoever said it was a cure for diabetes? And who, having seen a diabetic attack, could possibly deny the immense boon of insulin?

The antivivisectionist's argument that every creature, however lowly, should live its life unmolested, however destructive that life may be, seems to deny Nature, for everywhere we look with perception and understanding we see in operation the law that decrees that only the fittest should survive. Every living thing exists because, however momentarily, it has conquered its environment. In advancing medicine by using animals to discover, measure and understand, man is fulfilling his destiny. Out of pain and suffering, that men themselves have not shirked, have come anæsthetics, antibiotics, sulphonamides, vaccines and a host of other pharmaceuticals that help to make the human race more secure from disease and injury than ever before. And the animal world too has benefited. Have the antivivisectionists heard of the British Veterinary Codex? Would they deny to a cow suffering from mastitis the gift of penicillin? Emotion makes strong argument but poor logic.

Haphazard quality control

EVEN in the present state of instrumentation and automatic control there is nothing to match hand, eye and brain for quality control in many industries. Inspection of filled ampoules for spicules is only one example of thousands of inspection jobs that have to be done " by hand." That being so it is extraordinary how casual some firms are in selecting and training inspectors. Some amazing facts were brought out at a recent conference on inspection arranged by the National Institute of Industrial Psychology. Inspectors were found to be recruited in many ways, mostly unsystematic. One firm engaged outside applicants, another promoted their skilled workers to the job, and yet another drew inspectors from their worst workers. It was quite usual in other firms to entrust quality control to people too old or inefficient for any other work. Training methods were equally haphazard.

Remedies of two kinds were suggested. First, inspectors should be chosen more carefully. Eyesight tests, simple intelligence and observation tests, and tests of manual dexterity have all been found valuable. The Institute have also devised a training scheme which is now being tried out at a new factory and seems to be giving good results.

The other line of action is to make the actual job of inspection easier. The conference agreed that it was a fatiguing task and the effort of fixing attention for long periods could lead to errors of judgment. Boredom could be avoided by giving the inspector rest-breaks or an occasional change of job. Supplying an inspector with regular information about the quality of his or her work had also been found a good stimulus to efficiency.

The staff of the Institute recommended that managements should give more attention to lighting and other working conditions for inspectors. Receptacles for products of different grades had been found helpful, for example, and so had closer regulation of the size of batch to be inspected. Where quality was measured by a needle on a dial, the tolerance limits could be made clear by colouring part of the scale. Unnecessary movements should be cut down. One girl mentioned at the conference had been found to be lifting her foot all day to use a badly-adjusted pedal, until the weekly total of her needless movements amounted to more than half the height of Mount Everest.

Purity can kill perfumes

NOTHING is more difficult to describe exactly than a perfume. Perfumers who fall back on the term " pure " when specifying perfumery chemicals are apt to be disappointed because very often it is the impurities that give a chemical its characteristic smell. Thus, geranyl caproate and linalyl cinnamate are odourless when chemically pure, while pure linalyl acetate can be mistaken for terpenyl acetate when judged on odour alone.

The exact interpretation of the customer's idea of a " pure " substance is a problem which perfumery chemical manufacturers are having to face more frequently these days because of the increasing demand for so-called pure chemicals. Often it can only be resolved by having a sample of what is required for comparison. Discussing these snags in a lecture given recently before the Society of Cosmetic Chemists in London, Mr. R. A. A. Lacey praised gas-phase chromatography for its ability to analyse even minute samples of perfumery chemicals. With this instrument in his laboratory, a manufacturer can get a very clear idea of what the customer wants. Mr. Lacey showed a number of chromatograms of impurities isolated from commercial products. A striking illustration of the high sensitivity of the beta-ray argon detector was a chromatogram carried out on less than 0·1 micro litre of orange oil in which the terpene portion had been passed rapidly through the column in order to resolve the non-terpene portion into more than a dozen well-defined peaks.

However, Mr. Lacey conceded that even gas phase chromatography cannot yet match the sensitivity of the nose in judging highly odorous

materials. While chromatography is a powerful tool for analysis and control the nose is still the ultimate judge of delicate perfume blends.

Since impurities very often make the odour that is required, should manufacturers isolate them and sell them to perfumers to blend as required? The answer to this, according to Mr. Lacey, is that while theoretically such a procedure is possible the additional processing needed would make the products too expensive. So it seems that perfumers will have to continue to buy the elusive impurities of their art in the way they have always been made—as constituents of " pure " chemicals.

Forty revolutionary years

It is safe to say that in the last half-century there have been more changes in drugs and medicines than in the whole of the preceding thousand years. An analysis by the U.S. Public Health Service shows that in 40 years the percentage of botanicals used in medicine has dropped from 80% to 30% while the percentage of organic chemical drugs has increased from 10% to 50% and inorganics from 10% to 20%. The era of rapid change was started by the first sulphonamides in 1937, followed quickly by penicillin in 1940, and accelerated by the cortisones in 1950. In the U.S., since 1948 more than 3,000 new prescription drugs have entered the market, each with a life span of two to five years. The volume of manufactured prescription items has increased from $250 million in 1929 to more than $2,000 million in 1956. Antibiotics alone accounted for twice as much expenditure as the total spent on drugs in 1929. "Psycho-pharmacological" preparations are now perhaps the most dynamic group; they account for 7% of the total spent on drugs by U.S. Public Health Service hospitals and this proportion is increasing.

Drugs are naturally dearer today than ever before. In the U.S. the average prescription costs twice as much as in 1946 and three times as much as in 1929. But this would seem to be only in line with the general rise in prices. Against this must be set the enormous advantages in human and economic terms achieved by modern medicine. For instance, deaths from all infectious diseases have fallen in the U.S. from 676·2 per 100,000 in 1900 to only 44·3 per 100,000. In ten years alone—from 1945 to 1955—deaths from the chief diseases of childhood have fallen from 10 to 1 per 100,000.

These achievements are paralleled in Britain and, indeed, in every country which has been able to enjoy the advantages of modern pharmaceutical research. Far from grumbling at the cost of drugs we should be heartily glad that we live in an age blessed by these fruits of enlightened scientific progress. It should also be kept constantly in mind by everyone who pays the bill—Governments and private citizens alike—that unless manufacturers are allowed to make proper profits the source of new discoveries will dry up.

Arsenic, tobacco and cancer

Medical research workers at Texas University suggest that the carcinogenic component of tobacco is arsenic. Though it is the only component of tobacco smoke known to be capable of producing cancer in man, little attention has been given to it hitherto.

The arsenic in cigarette smoke mostly comes from the use of arsenical insecticides on tobacco plants; it is said to be carried into the smoke by attachment to particles of tar. Experimental evidence is cited in the U.S. journal, *Cancer* that about one-ninth of the arsenic in the average cigarette is inhaled during smoking.

For foods there is a maximum residual concentration of arsenic permissible under the U.S. Food and Drug laws, but tobacco is not a food. Analyses have found arsenic concentrations in cigarettes nearly 20 times as large as the maximum amount permissible for foods. It seems that in 25 years the arsenic content of a cigarette has increased from 2 to 6 times. This would tie up with a rising incidence of lung cancer among cigarette smokers *if* the Texas theory is right. Samples of five normal-sized U.S. brands of cigarettes showed arsenic content of from 42·5 to 52 p.p.m.—as against the 8 p.p.m. maximum allowed for foods.

If this arsenic theory is correct filter-tips are a real safeguard for they remove about a third of the arsenic in cigarette smoke. Quantitatively, 30 filter-tipped cigarettes would carry about the same risk as 20 non-tipped. But this would be small comfort for the tip-makers, for if the arsenic theory is proved there is a much better and simpler safeguard—ban the use of arsenical insecticides or weedkillers in tobacco growing.

It is surprising that there appears to be so much arsenic in tobacco. With the development of so many synthetic, non-arsenical pesticides, a much smaller use of arsenicals could have been expected. This may have occurred with food crops and sales pressure may have maintained or even increased the use of arsenicals on tobacco crops with the argument that the produce is non-edible. U.S. production of lead and calcium arsenates amounted to just over 19 million lb. in 1955, a relatively small drop from some 22 million lb. in 1952; and this was as much as one-sixth of the weight of DDT produced.

Despite the availability of so many non-arsenical insecticides, a lot of the older arsenates is still used. Lead arsenate dusts are recommended, with DDT as an alternative, for the control of weevils that attack tobacco seedlings, and paris green baits are also recommended for controlling beetle larvæ and cutworms. The most damaging tobacco pest is the hornworm, and lead arsenate was long used as the most reliable protectant—DDT has proved less effective. It may indeed be the hornworm that is responsible for so much arsenic in cigarettes.

A Guide to African Rauwolfia

By W. E. Court, M.PHARM., F.P.S.,* and G. E. Trease, B.PHARM., D. DE L'U., F.P.S., F.R.I.C.†

The production of hypotensives and tranquillisers from Rauwolfia alkaloids has created a heavy demand for Rauwolfia roots which has led to the world being combed for supplies, the original Indian source having proved inadequate. Eighty-six species of Rauwolfia have been found. Here is a pharmacognostical guide to the 20 African species.

INTEREST in the genus *Rauwolfia* as a source of pharmacologically active and clinically useful alkaloids resulted from the investigations of the Indian species *Rauwolfia serpentina* Benth. This erect, glabrous, evergreen shrub had been widely used in Indian native medicine for over 2,000 years and was mentioned, as Sarpagandha root, in the ancient Sanskrit medico - pharmaceutical treatise, the Charaksamhita.[1] The native tribesmen appeared to be aware of the sedative value of the drug and the poorer classes in Bihar made use of its hypnotic action in putting their children to sleep.[2] *Rauwolfia serpentina* was in use in Europe as long ago as 1690 and its value in the treatment of anxiety states was known; it is the increase in anxiety states due to the greatly accelerated pace of life in the last quarter of a century which has made the search for sedatives or tranquillisers so necessary. Since 1933 numerous chemical investigations of the roots have been published and at least 19 alkaloids have been isolated.[3] Pharmacological studies have demonstrated a characteristic hypotensive and tranquillising effect and, from the accumulated evidence,[3,4] it can be deduced that, of the three main groups of alkaloids present in the *Rauwolfia* species, the yellow anhydronium bases (serpentine, serpentinine and alstonine) and the tertiary indoline alkaloids (ajmaline, iso-adjmaline, neo-ajmaline and rauwolfinine) do not exert this characteristic action, whereas the tertiary indole alkaloids with a carbocyclic ring E (Fig. 1) do show marked pharmacological characteristics. This group includes reserpine, rescinnamine, deserpidine, yohimbine, corynanthine and rauwolscine; of these, only reserpine has been subjected to wide-spread experimentation and clinical usage.

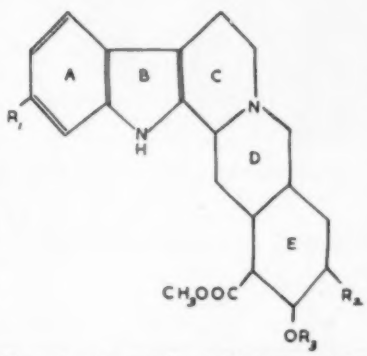
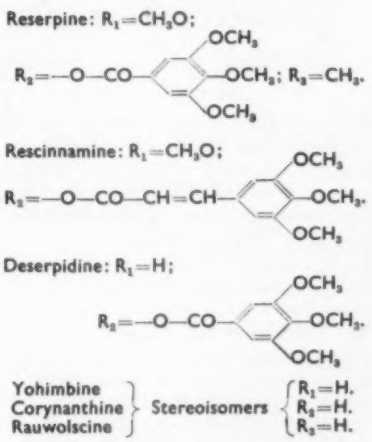


Fig. 1. Rauwolfia alkaloids; indole alkaloids with a carbocyclic ring E.



The main pharmacological characteristics of reserpine are slow onset of action, lowering of the blood pressure with no sympathicolytic or ganglionic blocking action, a marked hypnotic effect, stimulated peristalsis and bradycardia.[4] Clinically it has been shown to be a useful medicament in the treatment of mild hypertension, although side effects such as fatigue, drowsiness, bradycardia, nasal and conjunctival congestion, diarrhœa and vomiting have been reported. The use of the synergistic combination of reserpine with pentapyrrolidinium, pentolinium, hydrallazine, hexamethonium and pentacynium salts has the advantage of a better control over the blood pressure with a reduction of dosage and incidence of side effects, and has been successfully employed in the treatment of severe hypertension. Reserpine has also become widely used in the treatment of psychiatric conditions and, in combination with chlorpromazine, has been employed in the treatment of psychoses and manic and anxiety states and to counter excitation.[5]

World distribution of *Rauwolfia*

As more became known of the therapeutic value of *Rauwolfia serpentina*, the demand for supplies of roots from all parts of the world forced the Indian government to place intermittent embargoes on its export in order to conserve supplies. An immediate effect was a wide-spread survey of other *Rauwolfia* species which might have potential value as commercial sources of reserpine. The Index Kewensis and its eleven supplements list more than 175 separate species of *Rauwolfia*, but more recent work has demonstrated many cases of synonymy and Woodson has reduced the genus to 86 species in 13 geographical groups.[3] The approximate geographical distribution is:

	Species
Central and South America ..	34
Africa	20
Far East	24
India and Burma	7
Hawaii, New Guinea and New Caledonia	6

(Some species occur in more than one area.)

The members of the genus vary greatly in size and habit from small shrubs to medium and large trees and thus, botanically, the genus shows a wide range of structural adaptation.

The 20 species of *Rauwolfia* known to be indigenous to Africa grow in tropical and sub-tropical areas extending from Senegal in the west to Kenya in the east and Cape Province in the south (Fig. 2, Table 1). Only two species, *R. vomitoria* Afz. and *R. caffra* Sond.,

* Dept. of Pharmacy, Liverpool College of Technology.
† Dept. of Pharmacy, Nottingham University.

occur widely throughout these areas. The African species vary in size from the tiny subshrub *R. nana* E. A. Bruce to the medium and large trees *R. caffra* and *R. macrophylla* Stapf. (Table 1).[6]

Use of African *Rauwolfia* in native remedies

Many uses in tribal medicine have been recorded. The barks of *R. vomitoria*, *R. caffra*, *R. macrophylla* and *R. obscura* K. Schum., are used as purgatives. For the treatment of pimples and other skin conditions, the ground roots of *R. rosea* K. Schum., *R. mannii* Stapf., *R. mombasiana* Stapf., *R. vomitoria* and *R. caffra* are used. Decoctions of the roots of *R. vomitoria*, *R. macrophylla* and *R. mombasiana* are employed in the treatment of venereal diseases and the barks of some species, such as *R. rosea*, *R. mannii* and *R. obscura*, are used as arrow poison supplements.[6]

Rauwolfia vomitoria Afz.

This shrub or small tree growing up to 20 ft. high occurs widely in East, Central and West Tropical Africa. Numerous vernacular names have been recorded, the European name being "Swizzle-stick tree."[6] A wide variety of uses in tribal medicine have been reported including references to the sedative value of the roots in conditions of excitation.

Commercial *R. vomitoria* consists of short segments of the cylindrical or flattened, slightly tapering and occasionally branched roots usually 0·5-1·5 cm. in diameter. The outer surface shows a greyish-brown cork, often longitudinally furrowed or rubbed smooth. The outer cork, if present, has a soft texture and can be easily removed as irregular flakes by rubbing. The smoothed transverse surface of a root demonstrates a narrow bark, rarely exceeding 3 mm. in thickness, and a central core of buff or yellowish coloured, finely radiate, porous wood which, in the larger pieces, shows distinct growth rings.[7] The microscopical structure has been fully described and illustrated by Evans[7] and by Youngken.[8]

The constituents of *R. vomitoria* roots have been widely studied and ten alkaloids, including reserpine, have been isolated (Table 2). Various figures have been quoted for the reserpine content of *R. vomitoria* roots ranging from 0·005% to 0·2%. The relationship of alkaloidal yield to root diameter has been shown; Monseur reported 2·10%, 1·47% and 0·60% total alkaloids and 0·07%, 0·05% and 0·005% reserpine respectively for small, medium (approximately 2 cm. diameter) and large (approximately 6·5 cm. diameter) roots.[9] The results cited by Court, Evans and Trease[10] suggest that barks from roots of 1 cm. and 2 cm. diameter from any one sample of a species do not differ appreciably in their

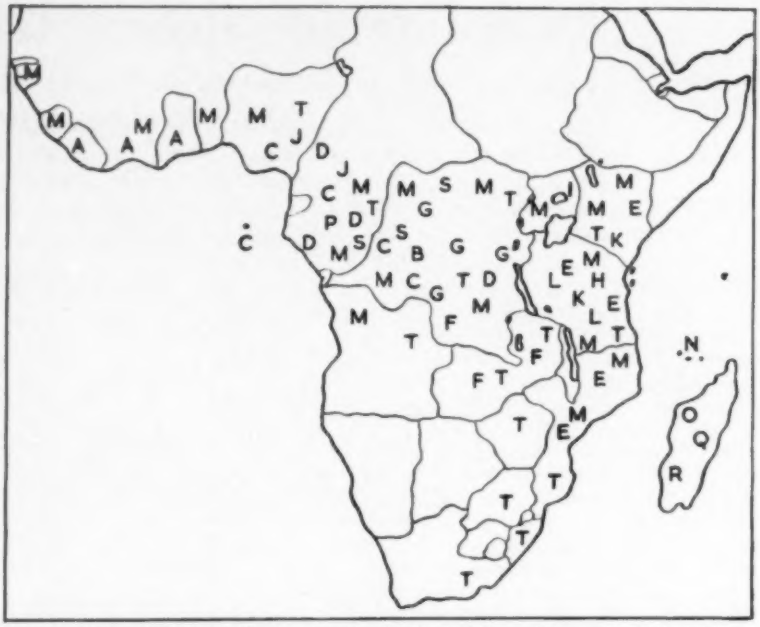
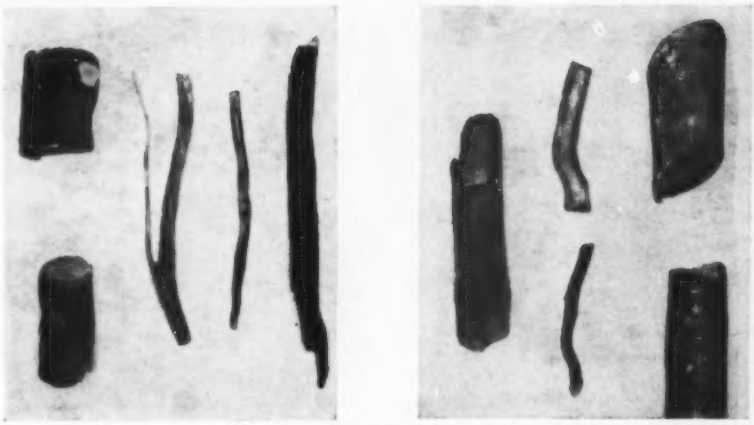


Fig. 2. Map of Africa indicating the distribution of *Rauwolfia* species. (See Table 1 for key to species.)

Table I. *Rauwolfia* Species Indigenous to Africa

Species	Habit	Occurrence	Map references	References
Ophioxylanthus (Pichon)	{ Corolla lobes not bent in the bud. Short thick stamen filaments.			
R. oreogiton Mfg.	Shrub; 3 ft. high	Tanganyika	H	21
R. volkensii Stapf. ...	Shrub; 6 ft.	Tanganyika, Mozambique	L	22
Afrovolfia (Pichon)	{ Corolla lobes not bent in the bud. Longer filaments, filiform towards base.			
R. caffra Sond.	Tree; 40-80 ft.	Widespread	T	6
R. concolor Pichon	—	Comoro Is.	N	3
R. confertiflora Pichon ...	—	Madagascar	O	3
R. media Pichon	—	Madagascar	Q	3
R. longeacuminata De Wild and Dur.	Tree	Lower Guinea, Congo	B	21
R. macrophylla Stapf. ...	Tree; 40-60 ft.	Upper Guinea, Cameroons	C	22
R. mannii Stapf.	Shrub; 6-10 ft.	Guinea, Congo	D	22
R. preussii K. Schum. ...	Shrub; 3-6 ft.	Guinea	J	21
R. mayombensis Pellegrin ...	Tree; 30-40 ft.	French Congo	P	21
R. obscura K. Schum. ...	Shrub; 1-5 ft	Congo	G	19
R. oxyphylla Stapf. ...	Tree; 30-60 ft.	Uganda	I	23
R. rosea K. Schum. ...	Shrub; 6 ft.	Mozambique	K	22
R. tchibangensis Pellegrin ...	Tree; 25-50 ft.	French Congo	S	21
R. nana E. A. Bruce ...	Subshrub; 6 in. high	Rhodesia	F	6
Endolobus (Pichon)	{ Corolla lobes bent in the bud; Apocarpous gynæcium.			
R. cumminsii Stapf. ...	Shrub	Upper Guinea	A	22
R. mombasiana Stapf. ...	Shrub; 6 ft.	Kenya, Mozambique	E	22
R. vomitoria Afz.	Small tree; 20 ft.	Widespread	M	6
Rhopalanthus (Pichon)	{ Corolla lobes bent in the bud; Syncarpous gynæcium.			
R. obtusiflora A. DC. ...	—	Madagascar	R	3

N.B.—R. mannii Stapf. is now generally regarded as the correct name for *R. preussii* K. Schum; the synonymy has not been fully proved.



Left: *Rauwolfia vomitoria*; Right: *Rauwolfia caffra*. Both illustrations are one-third natural size.

Table 2. The Alkaloids of *Rauwolfia vomitoria* Roots

Name	Empirical Formula	Melting Point	$(\alpha)_D$	References
Ajmaline	$C_{20}H_{26}O_2N_2$	158-160°	+128° ($CHCl_3$)	24, 25
Isoajmaline	$C_{20}H_{26}O_2N_2$	264-266°	+ 72° (EtOH)	24
Ajmalicine	$C_{21}H_{24}O_3N_2$	ca 254°	—	24
Ajmalinine	$C_{20}H_{26}O_3N_2$	180-181°	—	24
Alstonine	$C_{21}H_{20}O_3N_2$	over 300°	—	25
Reserpine	$C_{33}H_{40}O_9N_2$	284°	−124° ($CHCl_3$)	26
Raumitorine	$C_{23}H_{26}O_4N_2$	138°	+ 60° ($CHCl_3$)	27
Seredine	$C_{23}H_{30}O_5N_2$	291°	− 1° ($CHCl_3$)	27
Rescinnamine	$C_{35}H_{42}O_9N_2$	235-260°	− 99·2° ($CHCl_3$)	28, 29
Rauvomitine	$C_{20}H_{24}O_5N_2$	115-117°	−173·4° ($CHCl_3$)	30

alkaloidal content. As the barks yield 7 to 18 times more alkaloid than the corresponding woods, the variation in alkaloidal content of the whole roots of such samples depends on the larger proportion of wood to bark in the larger roots with a corresponding reduction of the overall alkaloidal yield. It is significant that some recent consignments of drug have comprised root bark only.

Rauwolfia caffra Sond.

Known in South Africa as the "Quinine Tree," this large tree, which reaches 40 to 80 ft. in height and 4 ft. in diameter, occurs widely distributed but not abundantly in secondary fringing forest in high rainfall areas, in open and gallery forests and in riverside woodlands. It normally occurs at an altitude of 3,000-6,000 ft. throughout the tropical areas of Africa extending from Nigeria in the west to Kenya in the east and Cape Colony in the south.[6]

The species *R. goetzii* Stapf. from Tanganyika, *R. obliquenervis* Stapf. from Tanganyika, *R. natalensis* Sond. from Pondoland and Natal, *R. ochrosioides* K. Schum. from Nyasaland, *R. inebrians* K. Schum., from Tanganyika and *R. welwitschii* Stapf. from Angola and Nigeria, originally regarded as separate species are now considered synonymous with *R. caffra*. These species were classified according to variations of leaf shape and structure which are no longer considered to be of taxonomic importance. Recent microscopical and chromatographic studies of the roots of *R. caffra* (=*welwitschii*) from Nigeria, *R. caffra* (=*natalensis*) from Pondoland and *R. caffra* from Rhodesia and Transvaal failed to produce any method of differentiation and confirm the synonymy of the species.[11] An illustrated description of the root and stem structure was published in 1957.[12] Juritz isolated a crystalline bitter alkaloid (yield 0·2%) from *R. natalensis* in 1901. Koepfli, in 1932, obtained two amorphous uncharacterised bases and an alkaloid of the empirical formula $C_{20}H_{28}O_3N_2$ or $C_{20}H_{24}O_2N_2$ which he named rauwolfine. This alkaloid from the bark of *R. caffra* caused a fall in blood pressure and respiratory stimulation in cats, dogs and rabbits and appeared to act on the brain centres rather than peripherally. Rindl and Groenewoud examined the bark of the South African "Quinine Trees" (*R. natalensis*, *Voacanga dregei* E. May and *Conopharyngia ventricosa* Stapf.) isolating cane sugar and four or more alkaloids which they did not characterise.[11] Recently Schüler and Warren have isolated ajmaline and reserpine from the roots, the yield being 0·015%.[13] McAleer, Weston and Howe have reported a yield of 0·01% reserpine[14] and Korzun, St. André and Ulshafer estimated 0·02% by a paper chromatographic method and demonstrated the probable presence of rescinnamine.[15]

The root bark of *R. caffra* contains commercially workable quantities of reserpine. The thin bark of small roots produces a higher alkaloidal yield than the thicker bark of large roots. The ratio of wood to bark is much greater in *R. caffra* than in *R. vomitoria* and accounts for the relatively low overall yields reported. Should this species become a commercial source of reserpine, the wood could be rejected at the time of collection. The stem bark does not apparently contain reserpine.[11, 13]

Rauwolfia mombasiana Stapf.

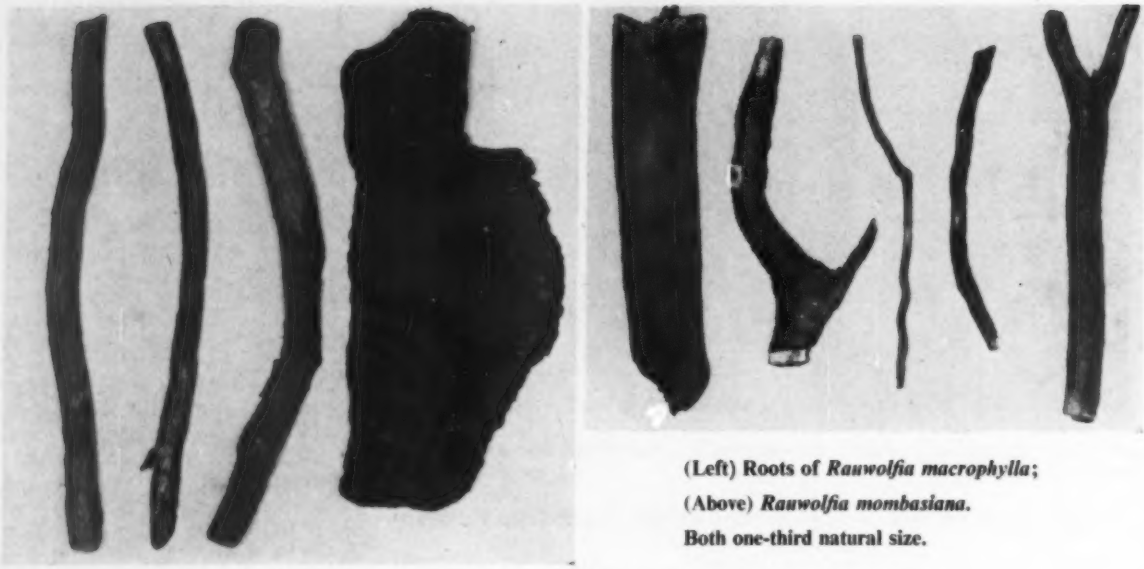
This species consists of large shrubs attaining a height of 7 ft. growing in Kenya and Mozambique. The hypotensive and adrenaline antagonistic actions of root extracts had been observed by Raymond-Hamet in 1940.[16] A pharmacognostical description was published in 1944[17] and McAleer, Watson and Howe isolated 0·116% of reserpine from the roots in 1956.[14] Chromatographic studies suggest the presence of the alkaloids rescinnamine and reserpiline.[15]

Rauwolfia macrophylla Stapf.

Rauwolfia macrophylla is a large tree, 40-60 ft. high, from the roots of which reserpine was isolated in 1957, a yield of 0·28% being recorded. A full pharmacognostical description was also published.[18]

Rauwolfia obscura K. Schum.

The occurrence of a trace of reserpine in the roots of this 2-5 ft. high shrub was reported by McAleer and his colleagues[14] and subsequently confirmed by Korzun and his co-workers who estimated the yield as 0·05% and, by a chromatographic method, demonstrated the probable presence of rescinnamine.[15] A brief description of the histology of the root has also been published.[19]



(Left) Roots of *Rauwolfia macrophylla*;
(Above) *Rauwolfia mombasiana*.
Both one-third natural size.

Other African species

Reserpine has also been isolated from the roots of *R. cumminsii* Stapf. (0·015%),[20] *R. mannii* (0·002%),[9] *R. rosea* (0·04%)[15] and *R. nana* (0·02%); ajmaline has been isolated from the roots of the last-named species.[9]

Differentiation

R. vomitoria is the only member of the African species to become an article of world commerce and, as the commercial synthesis of reserpine has yet to be achieved, natural sources must be used and further potential sources developed. Adulteration of *R. vomitoria* with other African species has been observed by the authors and presents a problem in differentiation.

R. caffra resembles *R. vomitoria* more closely than the other common species. Both are medium or large trees showing pronounced arboreal modifications. The more detailed microscopical measurements published by Evans[7] and Court, Evans and Trease,[12] show that the ranges overlap to a marked extent and histological examination revealed the stratification of the cork layers of *R. vomitoria* bark as the main difference between them. Woodson[3] has referred to this stratification as a normal phenomenon due to alternating periods of active growth and quiescence or to faulty observation of too thick sections. As *R. caffra* grows in the same geographical areas as *R. vomitoria*, it is reasonable to expect both or neither to show seasonal variations. It is significant, therefore, that Paris and Dillemann, describing *R. inebrians* from the Belgian Congo, a species they regarded as distinct until they confirmed its synonymy with *R. caffra* on the comparison of ionograms, reported the occurrence of lightly stratified cork.

This suggests that the presence or absence of stratification is not an absolute means of differentiation.

Of the other African *Rauwolfia* species so far described, *R. mombasiana* root shows a well-stratified cork[17] and *R. obscura* an occasionally stratified cork,[19] whilst *R. macrophylla* does not exhibit any stratification at all.[18] The root of *R. obscura* is apparently characterised by the absence of sclereids in the bark and also by very small xylem vessels (up to 56 microns diameter) and it can be readily differentiated from *R. vomitoria*. *R. macrophylla* root exhibits well-developed discontinuous sclereid groups in the phelloderm and small scattered stone cell groups in the secondary phloem[18] and, thus, whilst it can be differentiated from *R. caffra* and *R. vomitoria* by comparison of transverse sections, the separation of powdered specimens by microscopical examination is difficult.

It is apparent, therefore, that further studies will be necessary in order to obtain a satisfactory method for differentiating these African species in the powdered condition.

Future prospects

Published results show that the reserpine yield of the roots of the Africa species *R. vomitoria*, *R. mombasiana* and *R. caffra* is greater than that of the Indian species *R. serpentina*, *R. micrantha* Hook f., and *R. tetraphylla* (=*canescens*) Linn.[10] The commercial future of the African drugs must depend on availability, alkaloidal yield and cultivation experiments. To this end *R. vomitoria* is already being cultivated in the Belgian Congo. Most of these plants can be cultivated easily and grow quickly. Experimental data are not yet available to show whether the harvesting of small roots from the larger trees is economically preferable to the uprooting of the whole crop of subshrubs or shrubs. Should the latter be preferable, experimentation will be necessary to extend the geographical areas in which the shrubby species live.

REFERENCES

1. Srivasta, "History of Indian Pharmacy" (Calcutta: Pindars Ltd. (2nd Ed.), 1954), c. IV.
2. Datta, *Indian J. Pharm.*, 1949, **11**, 105.
3. "Rauwolfia" (Little, Brown and Company, Boston, 1957).
4. Lewis, *J. Pharm. Pharmacol.*, 1956, **8**, 465.
5. Symposia, *Ann. N.Y. Acad. Sci.*, 1954, **59**, 1-140; 1955, **61**, 1-280.
6. Feuell, *Colon. Pl. Anim. Prod.*, 1955, **5**, 1.
7. Evans, *J. Pharm. Pharmacol.*, 1956, **8**, 120.
8. Cantoria and Youngken, *Amer. J. Pharm.*, 1955, **127**, 36.

(Concluded on page 60)

Seven Methods of Determining the Active Constituent of MCPA Weedkillers

AN APPRAISAL BY I.C.I. ANALYSTS

By L. A. Haddock, R. Hill and A. G. Jones*

An appraisal has been made of the seven methods currently available for the determination of 4-chloro-2-methyl phenoxyacetic acid, the active constituent of selective weedkiller formulations based on methyl chlorophenoxyacetic acid (MCPA). It is considered that no one method will give satisfactory results with any type of commercial product; the most accurate results are obtainable with the differential refractometric method, if this is corrected for the presence of 2-methyl phenoxyacetic acid obtained by a second method, such as by gas chromatography of the methyl esters.

THE ACTIVE constituent of selective weedkiller formulations based on methyl chlorophenoxyacetic acid (MCPA) is 4-chloro-2-methyl phenoxyacetic acid. A number of methods has been proposed for the determination of the activity of such materials, not all of which give identical results with the same product. With the trend towards production of high activity technical acids and the need for a national and ultimately an international method of assay, an appraisal of the methods available seems to be opportune. The conclusions expressed herein have been reached as a result of practical work carried out in the General Chemicals Division of I.C.I. Ltd. over the past 10 years.

The determination of the activity of any product is made by examining the carboxylic acids which have been isolated from the product in such a way that they are free from cresols and, where the product is an ester formulation, from any high boiling alcohols. The discussion which follows will be confined to the determination of 4-chloro-2-methyl phenoxyacetic acid in the total water-insoluble acids extracted from the product or formulation.

During the past 10 years this determination has been carried out by us using one or more of the following general methods:

(1) Ultra-violet absorption spectrophotometry.
(2) Infra-red absorption spectrophotometry.
(3) Differential refractometry.
(4) Liquid-liquid partition chromatography.
(5) Gas chromatography applied to the methyl esters of the extracted acids.
(6) Cryoscopy.
(7) Isotope dilution.

* Imperial Chemical Industries Ltd., General Chemicals Division, Research Department, Widnes.

DISCUSSION

1. Ultra-violet spectrophotometric methods

Ultra-violet absorption methods for the determination of 4-chloro-2-methyl phenoxyacetic acid in MCPA have been suggested by Grabe,[1] Hill[2] and Duvaux.[3] In the first of these methods the assumption is made that no ultra-violet absorbing materials other than 4-chloro-, 6-chloro-, 4 : 6-dichloro- and unchlorinated 2-methyl phenoxyacetic acids are present, and since the 4-chloro-acid is the only one producing significant absorption at 287 mμ, measurements at this wavelength can be used to determine the active acid content. We have found that the above assumption is not justified for most commercial samples which contain small amounts of unidentified impurities that absorb in the 287 mμ region. The presence of such impurities is shown when measurable extinctions are obtained beyond 305 mμ for 0·01% solutions in 1 cm. cells.

The methods described by Hill and by Duvaux are not always satisfactory since 2-methyl phenoxyacetic acid, if present, interferes in the former and 4 : 6-dichloro-2-methyl phenoxyacetic acid in the latter. We consider that none of the ultra-violet methods, as published, can be relied upon to give accurate results for the 4-chloro-2-methyl-phenoxyacetic acid content of MCPA obtained from a wide variety of sources. However, we have found that Grabe's method can often be used after a preliminary purification process involving vacuum sublimation of the sample. The chloro-methyl phenoxyacetic acids sublime readily at 120°C., leaving behind up to 5% of a coloured tarry residue of relatively high molecular weight. The ultra-violet spectrum of the sublimate usually shows little absorption beyond 300 mμ, indicating that most of the interfering materials have been removed. A correction for any remaining background absorption due to these materials can be made by measuring a few extinctions between 305 and 320 mμ and extrapolating back to 287 mμ, making the assumption that the background is linear. By using the above purification procedure and correcting for irrelevant background in the purified product, results for 4-chloro-2-methyl phenoxyacetic acid more accurate than 2% can be obtained.

2. Infra-red spectrophotometric method

The only published method is that of Sjoberg.[4] This assumes the sample to be a mixture of 4-chloro-2-methyl-, 6-chloro-2-methyl-, 4 : 6-dichloro-2-methyl- and 2-methyl phenoxyacetic acids. By measuring the absorption of a solution of the sample at four wavelengths and using a series of calibration curves, its composition is estimated by

solving a series of four simultaneous equations; this technique is a common practice in infra-red analysis. From his work with synthetic mixtures, Sjoberg considered that the method should yield results for all four components having an error of less than $\pm 1{\cdot}5\%$ (actual). However, from the fact that technical MCPA contains a small amount of unidentified carboxylic acids which varies from sample to sample, we consider from this and from our own observations it is unlikely that the accuracy of the determination of the 4-chloro-2-methyl acid in such samples will be better than $\pm$ 2-3%.

3. Differential refractometric method

The method described by Hill[5] was considered to be free from interference by all the impurities normally associated with 4-chloro-2-methyl phenoxyacetic acid in MCPA. However, since publication of the method we have found that 2-methyl phenoxyacetic acid behaves anomalously when present above 3% and causes the 4-chloro-acid results to be higher, and sometimes considerably higher, than the true values. No simple means has yet been found of overcoming this trouble, and in order to apply the method to samples containing relatively large amounts of 2-methyl phenoxyacetic acid, an independent determination of this acid must be made either by infra-red examination or by a method involving gas chromatography of methyl esters made from the sample, so that a correction can be applied to the differential refractometric result for the 4 - chloro - 2 - methyl phenoxyacetic acid content.

Apparatus used for differential refractometry is illustrated in Figs. 1 and 2.

4. Chromatographic method

In principle, the method described by Freeman and Gardner[6] is probably the least open to doubt of all the published methods, but because of the practical difficulties encountered in packing efficient columns, *i.e.* columns giving an adequate separation between the 4 : 6-dichloro-, 4-chloro- and 6-chloro - 2 - methyl phenoxyacetic acids, gross systematic errors sometimes can be made. In addition to systematic errors, we have found that the method is subject to fairly large random errors so that the precision of the results for the 4 - chloro - 2 - methyl phenoxyacetic acid content of MCPA samples, expressed as 95% confidence limits of a single determination, is not better than $\pm 3\%$ when the determination is carried out under carefully controlled conditions; in a process-control laboratory which employs less skilled personnel a precision of $\pm 5\%$ was obtained. It appears, therefore, that the method in its present form is not satisfactory for the analysis of the "high activity" MCPA being produced at the present time. It should be borne in mind that an ultra - violet spectrophotometric rather than a titrimetric determination of the separated 4-chloro-2-methyl phenoxyacetic acid obtained by this method is in general more accurate and may be more precise.

Apparatus for chromatography is illustrated in Fig. 3.

5. Gas Chromatography applied to the methyl esters of extracted acids

In this procedure a portion of the extracted acids is esterified with methanol. The yield of ester is about 95% of the theoretical, and since the esterification procedure is reproducible we think it is safe to assume that for each individual acid the proportion esterified is constant from run to run, although for the impurities the proportions may be less than 95%.

We have separated the methyl esters of 2-methyl, 6-chloro-2-methyl-, 4 - chloro - 2 - methyl- and 4 : 6 - dichloro - 2 - methyl - phenoxyacetic acids, in the order listed, on a 6 ft. column comprising 20% (w/w) sodium dodecylbenzene sulphonate on 35/80 mesh *Chromosorb* operating at 200°C. Determination of the 4 - chloro - 2 - methyl-phenoxyacetic acid content has been made in one of two ways:

(*a*) By measuring the height or area of the main elution peak from a known weight of ester and relating this to the height or area of the 4-chloro-2-methyl-phenoxyacetic acid methyl ester peak obtained from a known weight of the methyl esters prepared from an artificial sample of MCPA of similar composition to that of the unknown sample.

(*b*) By estimating the quantity of each impurity detected (again

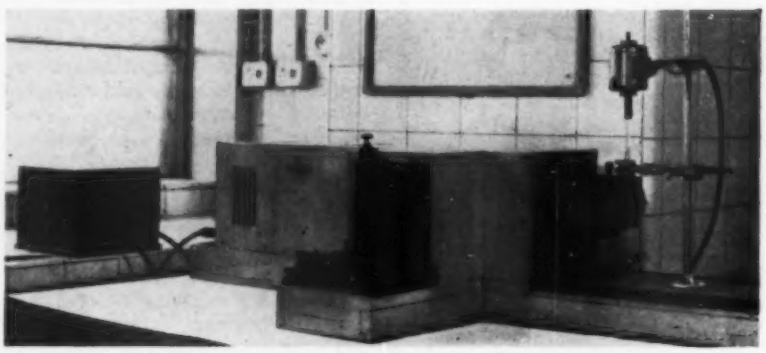


Fig. 1. Differential refractometric method. The differential refractometer.

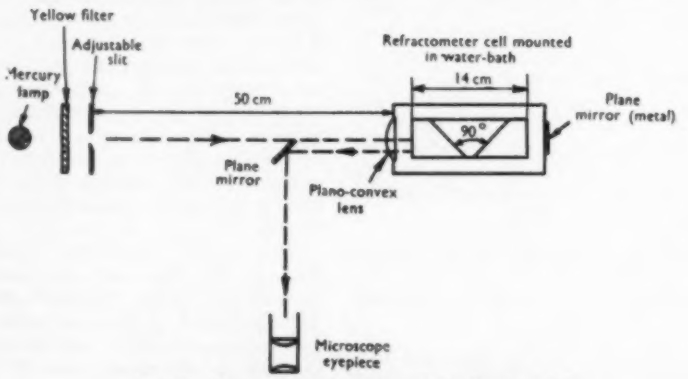


Fig. 2. Arrangement of differential refractometer.

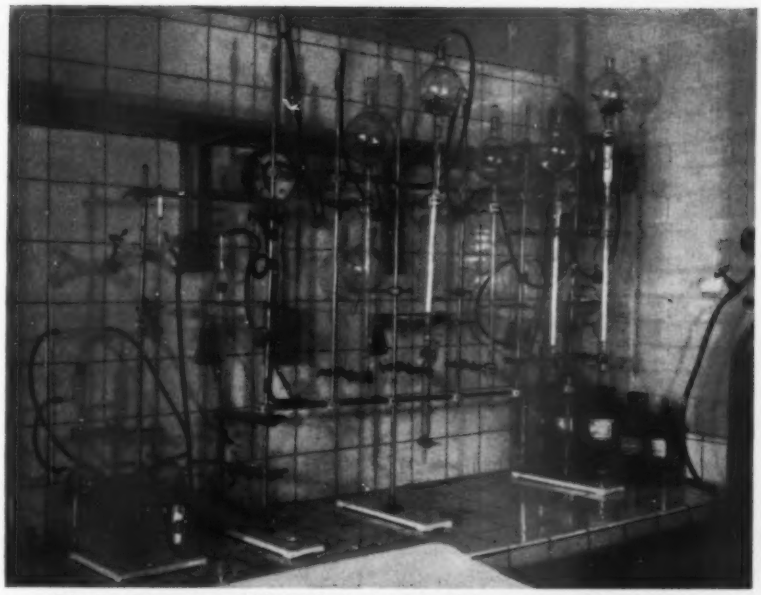


Fig. 3. Chromatographic method. A bank of chromatographic columns.

Fig. 4. Gas chromatography of the methyl esters of extracted acids. A typical gas chromatograph.

by relating the peak heights or areas to the corresponding peaks obtained from esterified artificial MCPA samples) and subtracting the sum of these figures from 100.

In both cases errors may arise from the presence of impurities with about the same retention time as the main component, and from the method of measurement employed. In the second case there are two additional potential sources of error arising from the presence of impurities which do not esterify and from esterified impurities with very long retention times which may not be observed.

We have found that esters corresponding to acids not normally thought to be present in MCPA are quite often observed in the chromatograms, and we have good reasons for believing that in some cases impurity components, which have not yet been identified, are present under the main band.

We feel therefore that results obtained by this method for the 4 - chloro - 2 - methyl phenoxyacetic acid content of MCPA must, in the absence of supporting evidence, be regarded as maximum figures. However, since the stationary phase we have used is not necessarily the best one for the problem it seems likely that as more becomes known about the impurities present in MCPA it will be possible to choose column conditions such that all the impurities will be separated from the main band, in which case an accuracy of $\pm 2\%$ or better should be attainable.

A typical gas chromatograph is shown in Fig. 4.

6. Cryoscopic method

The melting point of a mixture comprising a main component with small amounts of impurities is, in general, lower than that of the pure main component. Although the magnitude of the melting point depression is dependent upon the molecular weights as well as the amounts of the impurities present, provided that the approximate composition of impurities is known, it should be possible to make a fairly accurate estimation of the total impurity content of a sample from its melting point.

We found that melting points of samples of MCPA containing less than 95% of 4-chloro-2-methyl phenoxyacetic acid were difficult to reproduce, and so we turned our attention to the determination of crystallising points rather than melting points. The apparatus we used was similar to that described by Zeumer[7] for the determination of crystallising points of 2 g. samples of *Lindane*, but instead of using a thermocouple for the measurement of temperature we used a thermistor. We found that crystallising points of MCPA samples were reproducible to better than 0·3°C. for materials containing 5 to 15% of impurity. (Note 1°C. melting point depression is equivalent to about 2% of impurity.) The accuracy of the determination of the total impurity content from the crystallising point was of course dependent upon how near the composition of the sample was to the compositions of the artificial samples used for calibration purposes. To attain high accuracy on a sample of unknown composition the following procedure was adopted:

(*a*) A calibration graph of crystallising point against % impurity was prepared for 4-chloro-2-methyl phenoxyacetic acid containing 0 to 15% of the 6-chloro-isomer.

(*b*) The crystallising point of the sample was determined and its approximate impurity content obtained from the graph prepared above.

(*c*) The equivalent weight of the sample was determined to ascertain whether the material was under- or over-chlorinated.

(*d*) Three or four artificial samples containing, as impurity, mixtures of 6-chloro-2-methyl-phenoxyacetic acid with either 4 : 6-dichloro - 2 - methyl phenoxyacetic acid or 2-methyl phenoxyacetic acid were prepared such that (i) the range of total impurity was 2% to 3% either side the approximate value obtained for the sample, and (ii) the equivalent weights were very close to that of the sample.

(*e*) A plot of crystallising point against % impurity was constructed and used to obtain a corrected value for the impurity content of the sample.

This procedure was found to give results which were accurate to about ±1%, provided that (i) the amount of high molecular weight tarry material present was not more than 2%, and (ii) the content of 2-methyl phenoxyacetic acid was not more than 5%. To overcome the first of these possibilities the vacuum sublimation purification procedure described previously was used, and to overcome the second the sample was mixed with a known proportion of pure 4-chloro-2-methyl phenoxyacetic acid to reduce the effective content of the 2-methyl acid.

This method, which was developed at about the same time as the differential refractometric method, proved very valuable in our early work with "high activity" MCPA and is still employed occasionally in special investigations. However, we do not feel that the method can be recommended for general use without further examination.

7. Isotope dilution

This technique has been applied to the analysis of MCPA by Sorensen.[8] A known weight of acids extracted from the sample is mixed with a small known weight of radioactive 4 - chloro - 2 - methyl phenoxyacetic acid of known radioactivity (containing Cl^{36}) and the mixture dissolved in alkali. The acids are re-precipitated with 4N hydrochloric acid and isolated by filtering or decanting. They are then refluxed with aniline and the crude anilides obtained are recrystallised from 61% alcohol, when the solid remaining should be a pure specimen of the anilide of the 4-chloro-2-methyl acid. The radioactivity of this material is determined and from a knowledge of the initial and final radioactivities and the weight of radioactive and inactive material originally taken it is possible to calculate the % 4-chloro-2-methyl acid present in the sample.

Sorensen claims an accuracy of about ±1·5%. We have not used this particular method, but from our experience with the isotope dilution technique as applied to similar isomer analyses we consider that the general accuracy of such a method would be little better than ±2-3%. While the method will doubtless always be of value in referee work, it seems unlikely at the present time to find acceptance for general laboratory purposes.

CONCLUSION

It has become obvious from our investigation that some methods will give accurate results for the 4-chloro-2-methyl acid with products made by a particular process but not with those made by another route.

Until the identity of all the acids associated with 4-chloro-2-methyl phenoxyacetic acid in MCPA is fully known, no one method can be relied upon to give accurate results with all products. Those who wish to examine samples submitted from many diverse sources should use at least two of the above methods for an activity determination. The best accuracy seems to be obtainable with the differential refractometric method if supported by a determination of the 2-methyl phenoxyacetic acid content made by gas chromatography.

The liquid-liquid chromatographic method will, as far as we are aware, give results which are independent of the impurities present, but its reproducibility is poor and considerable difficulty is often experienced in its execution; a number of modifications of this technique are being examined in various laboratories and this opinion may need reassessment at some time in the future.

REFERENCES

1. E. Grabe, *Acta Chem. Scand.*, 1950, **4**, 806.
2. R. Hill, *Analyst*, 1952, **77**, 67.
3. M. Duvaux, *Chim. et Ind.*, 1953, **70**, 891.
4. B. Sjoberg, *Acta. Chem. Scand.*, 1950, **4**, 798.
5. R. Hill, *Analyst*, 1956, **81**, 323.
6. F. Freeman and K. Gardner, *ibid.*, 1953, **78**, 205.
7. H. Zeumer, *Nachrichtenblatt des Deutschen. Pflanzenschutzdienstes*, 1953, **5**, 132.
8. P. Sorensen, *Acta. Chem. Scand.*, 1951, **5**, 630; *Anal. Chem.* 1954, **26**, 1581.

A GUIDE TO AFRICAN RAUWOLFIA

(Continued from page 56)

9. Monseur, *J. Pharm. Belg.*, 1957, **12**, 39.
10. Court, Evans and Trease, *J. Pharm. Pharmacol.*, 1958, **10**, 380.
11. Court, M.Pharm. Thesis, Nottingham University, 1958.
12. Court, Evans and Trease, *J. Pharm. Pharmacol.*, 1957, **9**, 237.
13. Schüler and Warren, *J. Chem-Soc.* 1956, 215.
14. McAleer, Weston and Howe, *Chem. and Ind.*, 1956, 1387.
15. Korzun, St. André and Ulshafer, *J. Amer. Pharm. Ass.*, Sci. Ed., 1957, **46**, 722.
16. Raymond-Hamet, *C.R. Acad. Sci., Paris*, 1940, **210**, 789.
17. Delourme - Houde, Doct. Pharm. Thesis, Paris University, 1944.
18. Paris, Dillemann and Chaumelle, *Ann. Pharm. franc.*, 1957, **15**, 360.
19. Paris and Dillemann, *ibid.*, 1956, **14**, 505.
20. Schüler and Warren, *Chem. and Ind.*, 1955, 1593.
21. Taylor, private communication, Royal Botanic Gardens, Kew.
22. Thiselton-Dyer, "Flora of Tropical Africa" (London: Lovell Reeve and Co. Ltd., 1904), Vol. IV.
23. Stapf, *Kew Bulletin*, 1908, 407.
24. Paris, *Ann. Pharm. franc.*, 1943, **1**, 138-42.
25. Schlittler, Schwarz and Bader, *Helv. Chim. Acta*, 1952, **35**, 271-6.
26. Poisson, Lehir, Goutarel and Janot, *C.R. Acad. Sci., Paris*, 1953, **238**, 1607-9.
27. Poisson, Le Hir, Goutarel and Janot, *ibid.*, 1954, **239**, 302.
28. Haack, Popelak and Spingler, *Naturwiss.*, 1954, **41**, 214.
29. Kidd, *Chem. and Ind.*, 1955, 1481.
30. Haack, Popelak and Spingler, *Naturwiss.*, 1955, **42**, 627.

Organotin Compounds. A leaflet available from Pure Chemicals Ltd. describes a number of different uses of organotin compounds. Of particular interest is the biocidal activity of tri-alkyl and tri-aryl compounds, a property which has been used to provide new fungicides for paint, paper and agriculture. The publication gives details of the various applications of the compoounds in this field and also mentions the use of dibutyltin di-laurate as an anthelmintic in poultry.

How to Prevent Fires in Chemical Works

By F. E. T. Kingman,* PH.D., F.R.I.C.

Fire prevention is not just a matter of trying to set right a particular situation which, perhaps quite fortuitously, has caused a fire. Prevention starts with the design of the plant, including storage facilities, and continues with a thorough and sustained study of the hazards of the process, with strict adherence to good housekeeping. Finally, the whole preventive system must be backed by an alert and well-trained fire-fighting organisation. Dr. Kingman examines all these aspects of fire prevention in this authoritative and practical article.

INTRODUCTION

THE aim of this paper is to set forth briefly the general principles which should govern the fire prevention organisation of chemical plants and to show how the results of research into the causes, prevention and extinction of fires may be applied to this problem. At the outset it must be made clear that "fire prevention" must mean a great deal more than the necessary emergency measures to be adopted in case of fire and must include all the features in the design and operation of the plant which are incorporated to ensure both that the risk of a fire occurring is reduced to the practicable minimum and also that when a fire does occur the spread of fire and the hazard to life and loss of productive capacity are reduced as far as possible.

We may therefore consider fire prevention in chemical plants under the following headings:

1. Design of plant, including storage facilities.
2. Hazards of processes.
3. Fire protection—organisation and equipment.

DESIGN OF PLANT

If fire prevention is to be successful it must be considered in the earliest stages of the design of the plant, as an essential part of the general production scheme, so as to ensure the proper co-ordination of production efficiency with a high degree of fire safety. If this is not done at the beginning, safety considerations may necessitate modifications to the buildings and plant which will almost certainly be expensive and, still worse, may interfere with production. It would also be wise, at this initial stage, to consult the various official organisations, such as the Factory Inspectorate, who may be concerned with the operation of the plant.

* Head of Chemistry and Chemical Engineering Section of the Department of Scientific and Industrial Research and Fire Offices' Committee Joint Fire Research Organisation.

Crown copyright reserved

Extinction of oil fires by a fixed spray installation.

In dealing with the design of the plant one must include the buildings in which it is housed. It is true that in the chemical and allied industries this factor may be less important than in other manufacturing industries, and, particularly with the more hazardous chemicals, the frequent adoption of the open type of plant with small rooms for control equipment, etc., tends to reduce the relative importance of buildings in the fire protection scheme. Nevertheless, the following principles of structural fire protection should be applied as far as practicable. Adherence to them will not necessarily reduce the incidence of fires, but will help to prevent a minor fire from becoming large and even catastrophic.

(**a**) Where possible, large buildings should be divided into smaller compartments by fire-resisting walls.

(**b**) Where (*a*) is not possible and it is necessary to have large unrestricted areas, large stocks of combustible materials and finished goods should not be kept in the building, unless in compartments separated from the main area by fire-resisting walls. Similar precautions should be taken with processes with a special fire risk, *e.g.* paint spraying.

(**c**) The structural members of the building should have a fire-resistance appropriate to the type of building and process carried on so that in the event of fire the building will not collapse. A great deal of work on the fire-resistance of structures has been done at the Fire Research Station, Boreham Wood, and the fire-resistance of structures required for various types of buildings can be assessed

(*b*) The crystallising point of the sample was determined and its approximate impurity content obtained from the graph prepared above.

(*c*) The equivalent weight of the sample was determined to ascertain whether the material was under- or over-chlorinated.

(*d*) Three or four artificial samples containing, as impurity, mixtures of 6-chloro-2-methyl-phenoxyacetic acid with either 4 : 6-dichloro - 2 - methyl phenoxyacetic acid or 2-methyl phenoxyacetic acid were prepared such that (i) the range of total impurity was 2% to 3% either side the approximate value obtained for the sample, and (ii) the equivalent weights were very close to that of the sample.

(*e*) A plot of crystallising point against % impurity was constructed and used to obtain a corrected value for the impurity content of the sample.

This procedure was found to give results which were accurate to about ±1%, provided that (i) the amount of high molecular weight tarry material present was not more than 2%, and (ii) the content of 2-methyl phenoxyacetic acid was not more than 5%. To overcome the first of these possibilities the vacuum sublimation purification procedure described previously was used, and to overcome the second the sample was mixed with a known proportion of pure 4-chloro-2-methyl phenoxyacetic acid to reduce the effective content of the 2-methyl acid.

This method, which was developed at about the same time as the differential refractometric method, proved very valuable in our early work with "high activity" MCPA and is still employed occasionally in special investigations. However, we do not feel that the method can be recommended for general use without further examination.

7. Isotope dilution

This technique has been applied to the analysis of MCPA by Sorensen.[8] A known weight of acids extracted from the sample is mixed with a small known weight of radioactive 4 - chloro - 2 - methyl phenoxyacetic acid of known radioactivity (containing Cl^{36}) and the mixture dissolved in alkali. The acids are re-precipitated with 4N hydrochloric acid and isolated by filtering or decanting. They are then refluxed with aniline and the crude anilides obtained are recrystallised from 61% alcohol, when the solid remaining should be a pure specimen of the anilide of the 4-chloro-2-methyl acid. The radioactivity of this material is determined and from a knowledge of the initial and final radioactivities and the weight of radioactive and inactive material originally taken it is possible to calculate the % 4-chloro-2-methyl acid present in the sample.

Sorensen claims an accuracy of about ±1·5%. We have not used this particular method, but from our experience with the isotope dilution technique as applied to similar isomer analyses we consider that the general accuracy of such a method would be little better than ±2-3%. While the method will doubtless always be of value in referee work, it seems unlikely at the present time to find acceptance for general laboratory purposes.

CONCLUSION

It has become obvious from our investigation that some methods will give accurate results for the 4-chloro-2-methyl acid with products made by a particular process but not with those made by another route.

Until the identity of all the acids associated with 4-chloro-2-methyl phenoxyacetic acid in MCPA is fully known, no one method can be relied upon to give accurate results with all products. Those who wish to examine samples submitted from many diverse sources should use at least two of the above methods for an activity determination. The best accuracy seems to be obtainable with the differential refractometric method if supported by a determination of the 2-methyl phenoxyacetic acid content made by gas chromatography.

The liquid-liquid chromatographic method will, as far as we are aware, give results which are independent of the impurities present, but its reproducibility is poor and considerable difficulty is often experienced in its execution; a number of modifications of this technique are being examined in various laboratories and this opinion may need reassessment at some time in the future.

REFERENCES

1. E. Grabe, *Acta Chem. Scand.*, 1950, **4**, 806.
2. R. Hill, *Analyst*, 1952, **77**, 67.
3. M. Duvaux, *Chim. et Ind.*, 1953, **70**, 891.
4. B. Sjoberg, *Acta. Chem. Scand.*, 1950, **4**, 798.
5. R. Hill, *Analyst*, 1956, **81**, 323.
6. F. Freeman and K. Gardner, *ibid.*, 1953, **78**, 205.
7. H. Zeumer, *Nachrichtenblatt des Deutschen. Pflanzenschutzdienstes*, 1953, **5**, 132.
8. P. Sorensen, *Acta. Chem. Scand.*, 1951, **5**, 630; *Anal. Chem.* 1954, **26**, 1581.

A GUIDE TO AFRICAN RAUWOLFIA

(*Continued from page 56*)

9. Monseur, *J. Pharm. Belg.*, 1957, **12**, 39.
10. Court, Evans and Trease, *J. Pharm. Pharmacol.*, 1958, **10**, 380.
11. Court, M.Pharm. Thesis, Nottingham University, 1958.
12. Court, Evans and Trease, *J. Pharm. Pharmacol.*, 1957, **9**, 237.
13. Schüler and Warren, *J. Chem-Soc.* 1956, 215.
14. McAleer, Weston and Howe, *Chem. and Ind.*, 1956, 1387.
15. Korzun, St. André and Ulshafer, *J. Amer. Pharm. Ass.*, Sci. Ed., 1957, **46**, 722.
16. Raymond-Hamet, *C.R. Acad. Sci., Paris*, 1940, **210**, 789.
17. Delourme - Houde, Doct. Pharm. Thesis, Paris University, 1944.
18. Paris, Dillemann and Chaumelle, *Ann. Pharm. franc.*, 1957, **15**, 360.
19. Paris and Dillemann, *ibid.*, 1956, **14**, 505.
20. Schüler and Warren, *Chem. and Ind.*, 1955, 1593.
21. Taylor, private communication, Royal Botanic Gardens, Kew.
22. Thiselton-Dyer, "Flora of Tropical Africa" (London: Lovell Reeve and Co. Ltd., 1904), Vol. IV.
23. Stapf, *Kew Bulletin*, 1908, 407.
24. Paris, *Ann. Pharm. franc.*, 1943, **1**, 138-42.
25. Schlittler, Schwarz and Bader, *Helv. Chim. Acta*, 1952, **35**, 271-6.
26. Poisson, Lehir, Goutarel and Janot, *C.R. Acad. Sci., Paris*, 1953, **238**, 1607-9.
27. Poisson, Le Hir, Goutarel and Janot, *ibid.*, 1954, **239**, 302.
28. Haack, Popelak and Spingler, *Naturwiss.*, 1954, **41**, 214.
29. Kidd, *Chem. and Ind.*, 1955, 1481.
30. Haack, Popelak and Spingler, *Naturwiss.*, 1955, **42**, 627.

Organotin Compounds. A leaflet available from Pure Chemicals Ltd. describes a number of different uses of organotin compounds. Of particular interest is the biocidal activity of tri-alkyl and tri-aryl compounds, a property which has been used to provide new fungicides for paint, paper and agriculture. The publication gives details of the various applications of the compoounds in this field and also mentions the use of dibutyltin di-laurate as an anthelmintic in poultry.

How to Prevent Fires in Chemical Works

By F. E. T. Kingman,* PH.D., F.R.I.C.

Fire prevention is not just a matter of trying to set right a particular situation which, perhaps quite fortuitously, has caused a fire. Prevention starts with the design of the plant, including storage facilities, and continues with a thorough and sustained study of the hazards of the process, with strict adherence to good housekeeping. Finally, the whole preventive system must be backed by an alert and well-trained fire-fighting organisation. Dr. Kingman examines all these aspects of fire prevention in this authoritative and practical article.

INTRODUCTION

THE aim of this paper is to set forth briefly the general principles which should govern the fire prevention organisation of chemical plants and to show how the results of research into the causes, prevention and extinction of fires may be applied to this problem. At the outset it must be made clear that "fire prevention" must mean a great deal more than the necessary emergency measures to be adopted in case of fire and must include all the features in the design and operation of the plant which are incorporated to ensure both that the risk of a fire occurring is reduced to the practicable minimum and also that when a fire does occur the spread of fire and the hazard to life and loss of productive capacity are reduced as far as possible.

We may therefore consider fire prevention in chemical plants under the following headings:

1. Design of plant, including storage facilities.
2. Hazards of processes.
3. Fire protection—organisation and equipment.

DESIGN OF PLANT

If fire prevention is to be successful it must be considered in the earliest stages of the design of the plant, as an essential part of the general production scheme, so as to ensure the proper co-ordination of production efficiency with a high degree of fire safety. If this is not done at the beginning, safety considerations may necessitate modifications to the buildings and plant which will almost certainly be expensive and, still worse, may interfere with production. It would also be wise, at this initial stage, to consult the various official organisations, such as the Factory Inspectorate, who may be concerned with the operation of the plant.

* Head of Chemistry and Chemical Engineering Section of the Department of Scientific and Industrial Research and Fire Offices' Committee Joint Fire Research Organisation.

Crown copyright reserved

Extinction of oil fires by a fixed spray installation.

In dealing with the design of the plant one must include the buildings in which it is housed. It is true that in the chemical and allied industries this factor may be less important than in other manufacturing industries, and, particularly with the more hazardous chemicals, the frequent adoption of the open type of plant with small rooms for control equipment, etc., tends to reduce the relative importance of buildings in the fire protection scheme. Nevertheless, the following principles of structural fire protection should be applied as far as practicable. Adherence to them will not necessarily reduce the incidence of fires, but will help to prevent a minor fire from becoming large and even catastrophic.

(**a**) Where possible, large buildings should be divided into smaller compartments by fire-resisting walls.

(**b**) Where (*a*) is not possible and it is necessary to have large unrestricted areas, large stocks of combustible materials and finished goods should not be kept in the building, unless in compartments separated from the main area by fire-resisting walls. Similar precautions should be taken with processes with a special fire risk, *e.g.* paint spraying.

(**c**) The structural members of the building should have a fire-resistance appropriate to the type of building and process carried on so that in the event of fire the building will not collapse. A great deal of work on the fire-resistance of structures has been done at the Fire Research Station, Boreham Wood, and the fire-resistance of structures required for various types of buildings can be assessed

Crown copyright reserved

Test of venting of gas explosions in ducts.

by reference to tests carried out there according to British Standard 476: Part 1, 1953.

(**d**) Special attention should be paid to storage facilities, especially where hazardous materials are used. They should be sited and constructed so that a fire in a store will not form an exposure hazard to important items of plant. Replacement of raw materials will often cause less loss of production than the loss of plant.

(**e**) In designing the plant, special attention must be paid to those items of plant whose loss or immobilisation would hold up production and, more particularly, those items which it would not be possible to replace without delay and loss of production. It is usually easy to recognise those parts of plant in which the incidence of fire is most likely; it is even more important to give close attention to the essential plant items, which may have no particular fire hazard in themselves but which may be destroyed or damaged by exposure to fire in other parts of the plant. An important example of these are control rooms and equipment, particularly in view of the trend towards automation and centralisation of control equipment. Damage to these items, even with a small fire, might cause not only a heavy direct loss, but a very much heavier indirect loss by the hold-up in production. Where such important items cannot be duplicated or more widely distributed in the plant so that total immobilisation cannot occur, then they must be protected from exterior exposure by fire-resisting separating walls or special protective devices.

HAZARDS OF PROCESSES

The chemical and allied industries (including the petroleum industry) probably deal with a greater variety of hazardous materials and processes than any other group of industries, and the chemical industry has in fact always shown a considerable interest in the organisation of safety, including fire protection. It is not possible to detail all these risks, but certain broad groups may be described.

Flammable gases and liquids

The volume and variety of flammable gases and liquids used in the chemical industry are increasing yearly, and the processes used often involve high pressures and temperatures which create a greatly enhanced hazard should a mishap occur. The general problems of handling such materials have been studied over many years, and regulations and codes of practice have been developed dealing *inter alia* with such questions as the construction, spacing and fire protection of storage tanks and specifications for flameproof and intrinsically safe equipment for use in hazardous areas. These codes may well be adopted, with modifications, as necessary, for the handling of flammable solvents, etc., in the chemical and allied industries.

A major problem is the possibility of production, by accident or design, of flammable mixtures of air and gas, which are readily ignited by a small source of ignition and can explode, with serious consequences. The much wider use of flammable solvents has greatly increased this hazard, and the gas industry has shown commendable initiative in carrying out research on explosions in industrial drying ovens. While this was done in the context of the industry's special problems, it is applicable to all cases where an explosive gas or vapour, either from the product or heating medium, may be present in explosive concentrations in drying ovens. This research has shown how ovens may be designed with explosion reliefs which will reduce the pressure developed by an explosion to a safe level. Similar work on relief vents for explosions in ducts is also in progress at the Fire Research Station with a view to providing design data for the provision of explosion reliefs in duct systems.

Another line of defence which may be used with great advantage in plant handling flammable solvents and the like, particularly where a complicated duct system is involved, is the use of devices, such as flame arresters, which prevent the passage of an explosion from one part of a plant to another. These arresters have hitherto been designed mainly empirically, but the Fire Research Station is now trying to determine exactly what factors govern the performance of arresters in practice. It is already clear that, before installing such devices, technical advice should be taken; the performance of an arrester depends as much on its exact position in relation to the possible points where ignition can occur as on the nature of the material at risk.

Dusts

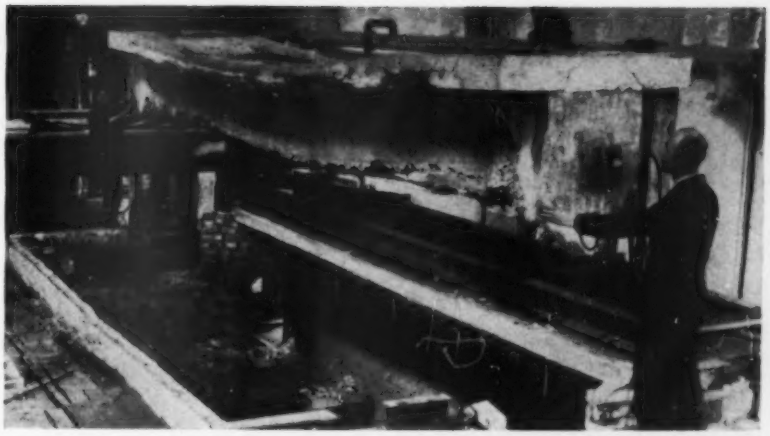
In spite of the number of dust explosions which have occurred in practice some industries still fail to realise that many combustible solids which burn quietly and slowly in bulk can explode violently if ignited when suspended in air as a dust cloud. Considerable work both on the assessment of the hazard of various dusts and the measures required to minimise the hazard has been done at the Safety in Mines Research Establishment at Buxton for the Factory Inspectorate of the Ministry of Labour and National Service. Factory Form 830 lists

dusts whose liability to explode has been assessed. Information on safety measures is also available.

Apart from the liability to cause explosions, combustible dusts can be a serious fire hazard even when present in quiescent layers. The Joint Fire Research Organisation has collected statistics of fires caused by frictional heating and sparks, and during the first year of the study it was found that of 355 fires attended by the public Fire Brigades and started by frictional heating and sparks, 310 occurred in solid materials such as dusts and textile fly, and only 25 in flammable gases and vapours. Furthermore, it has been shown that smouldering in dusts can be started much more easily than with common flammable materials such as newspaper and shavings, and is readily maintained provided the layer of dust is above a certain minimum thickness which may be as small as $\frac{1}{10}$ in. Under suitable conditions and in the presence of other loose flammable material, smouldering may develop into a serious fire, and even worse, if the dust is raised into a suspension in air a dust explosion may occur. The major safeguard against the hazard of dust in the factory workroom is good housekeeping and cleanliness, with the regular removal of dust, preferably by suction cleaning. In fighting fires in smouldering dusts it is important to use a gentle spray rather than a strong jet of water so that the dust is not raised into clouds with a consequent risk of dust explosions.

Unstable compounds

Many compounds previously regarded as laboratory chemicals only are now used on a large scale in the chemical industry. Some of these are relatively safe when used in small quantities, in the laboratory, but may show instability under plant conditions and when used in larger quantities. It is not possible to treat the subject in detail in this article, but great care should be taken in handling unstable substances when the process is translated from the laboratory to plant scale. In many cases the manufacturers of these substances have carried out considerable research on their behaviour under different conditions, and issue recommendations as to the conditions under which they may be used in safety, their suitable storage, and the maximum amount which should be handled; it is vital for safety to observe closely such recommendations to avoid hazards from violent thermal decomposition or explosions.



Crown copyright reserved

Prestressed structural member after test for fire-resistance.

The Research Board of the Joint Fire Research Organisation has set up a Committee on Industrial Fires and Explosions to advise on the research needed on these problems and to co-ordinate details of other work on the subject done in this country and elsewhere. Information on the work of the Committee is given in the Reports of the Joint Fire Research Organization, "Fire Research," published annually by H.M. Stationery Office.

FIRE PROTECTION—ORGANISATION AND EQUIPMENT

So far I have dealt with the measures taken to eliminate as far as possible the incidence of fire, and to restrict its spread. Finally we may consider the organisation and equipment to deal with fires when they occur. The equipment will vary greatly with different plants, but certain essentials are common to all. These are briefly:

(**a**) Complete understanding by the management of any special risks involved in the processes used, with clear and specific instructions to operators on the steps to be taken when fires or other emergencies occur. All staff must clearly understand and practise where possible what they have to do if a fire occurs.

(**b**) Suitable fire-fighting facilities whose siting and operation are known thoroughly by the works staff. The provision of a works fire brigade will depend on the size of the works, and in my opinion even in the largest works fire-fighting should not be left entirely to a full-time brigade. I would prefer the type of organisation which depends on a nucleus of full-time men backed by other trained personnel normally working on the plant, since the essence of fire-fighting is speed. Thus a trained and determined plant operator may well extinguish a fire in the early stages with comparative ease; the same fire at a later stage may tax the best efforts of the fire brigade.

(**c**) Full liaison with the local Fire Brigade and the fire prevention department is essential. In view of the complexity of materials and processes used in the modern chemical industry it is quite unfair to expect a local Fire Brigade to give real assistance unless they are given the opportunity to study the hazards involved before a fire occurs. Further, on many of the points raised earlier in this article, and particularly for the smaller firms, useful advice and guidance may be obtained from the fire prevention department of the Fire Brigade.

(**d**) Incidents involving fires or explosions should be carefully recorded and investigated. The investigations should not primarily be for the purpose of allocating blame to any individual, but in order to see what lapse from or weakness in the normal procedure might have caused the fire and what could be done to prevent its recurrence. I would like to stress two points in this connection. Firstly, it is important to study the minor incidents, since the causes of minor incidents and major catastro-

phes are frequently the same, and only some slight variation in the chain of circumstances decides whether a fire is a small or a major one. Thus, the study of minor fires may lead to measures which will not only prevent their recurrence but also prevent a larger conflagration. In addition, the minor fires, in which the damage has been arrested at an early stage, will generally give more clear and definite information than the examination of a large fire. Secondly, it is important not to be obsessed by the immediate cause of fire. While this may be important, in many cases the igniting source is purely fortuitous and less important than the conditions which allow the fire to take hold and spread.

I shall not attempt in this brief article to detail the fire-fighting equipment, since the requirements will vary according to the nature of the plant and process, and detailed advice can be obtained from various organisations, including the public Fire Brigades and the Fire Protection Association of the Fire Offices' Committee.

In general, the most useful extinguishing agent is water, using fire appliances or fixed extinguishing systems, while for flammable liquids, particularly of low flash point, foam is best. In recent years, however, there have been marked developments in the production of special extinguishing agents such as dry powders, and vaporising liquid extinguishing agents of higher efficiency such as chlorobromomethane and trifluorobromomethane. These agents are valuable for special risks and for first-aid fire-fighting, but the value of good supplies of water (or foam where appropriate) is still an essential feature of fire-fighting for most major risks.

CONCLUSION

To sum up, it will be seen that the problem of fire prevention is one which must be considered at all stages of development, beginning with the initial design of the plant. It demands a thorough and constant study of the hazards of the process, with strict adherence to all the rules of "good housekeeping," the whole backed by an alert and well-trained fire-fighting organisation.

Acknowledgement. The work described in this paper forms part of the programme of the Joint Fire

(*Concluded on p. 67*)

Equipment for Preventing

This review covers systems of automatic fire detection and explosion suppression, fire alarms, extinguishers, hoses, fire engines, fire-proof construction, flame-proof electrical systems and portable lamps for fire-fighting duties.

Automatic fire detection

DETECTION of fire at the earliest possible moment is obviously of primary importance if the fire is to be brought under control rapidly. The *Mark IV* system, which is claimed to give a virtually unlimited number of fire area section indications at a central control panel, has been developed by Sound Diffusion (Auto-Thermatic) Ltd. The control is achieved without making use of individual wiring between each section and the central control equipment. A relay unit is placed in each fire area section and automatic heat detectors are connected to it. These detectors consist of break link cable, a single flexible conductor cut at 3 ft. intervals and rejoined with a low melting-point (usually 120°F.) solder. The cable is mounted parallel to the ceiling on moulded insulators. The distance from the cable to the ceiling varies between 1 in. and 1½ in., the optimum levels for heat detection. The cable is held taut by tension springs which are inserted at convenient points.

At the outbreak of fire one or more of the solder links will melt when the ascending air currents raise their temperature to 120°F. The cable will then fall apart and interrupt the steady current which is flowing through it. The interruption of this current causes the central control panel to operate the alarms.

Developments are in hand to provide extremely rapid detection of fire occurring inside chemical plants. The equipment, which the manufacturers claim will be capable of giving an alarm signal in about $\frac{1}{10}$th of a second, can be triggered from burning particles whose size can be as small as 20 microns.

Also available from the company is equipment which can be used in conjunction with a standard diaphram switch fitted into the sprinkler system, which will result in an alarm signal being given at the local Fire Station immediately the sprinkler head operates. The equipment may be connected to the Brigade by either a private Post Office line or, alternatively, by a "999" dialling unit operating over the Post Office emergency service. Under alarm conditions duplicated lamps on the Fire Station termination panel pulse and an audible alarm signal is given. In the event of any line faults occurring an alternative distinctive signal is given at the Fire Station.

The *Auto-Dialling* unit, which may operate in conjunction with the equipment as an alternative to direct Post Office line termination represents a new development. It consists of a 45 r.p.m. record and crystal pick-up on to which has been recorded both the dialling code and the alarm message. When the equipment is operated the dialling code is translated into a dialling sequence by means of a transistor circuitry. The alarm message follows immediately and is repeated for approximately four minutes. At the end of this time the Post Office line circuit is disengaged and re-engaged some four seconds later. A further message to a different number is then passed through to the exchange. This second message can be repeated, if required, to an alternative number.

Another form of fire detection is the *Minerva* detector, available from the Minerva Detector Co. Ltd., in which the sensitive element is an open ionisation chamber. According to the manufacturers a particular application of the system is the detection of combustion products or smoke carried over by cooling or drying air streams passing through process equipment. For this a suitably positioned probe bleeds the sample of the air into an expansion chamber in which the Minerva detector is supported and returns it to the main stream. The detector monitors the air passing the open ionisatisn chamber and raises an alarm as soon as the concentration of combustion products reaches a predetermined level. This is stated to indicate the beginning of burning in the stock long before any appreciable heat is generated or flame breaks out.

Similar considerations apply to the use of the detector together with probes in the detection of incipient fires in air-cooled control equipment, computers, *etc.*, as well as in the extract ducts from air-conditioned spaces.

Explosion suppression

Originally developed for vapour explosion risks, the industrial applications of the Graviner Co.'s explosion and fire protection systems employ several tech-

The sprinkler termination switch available from sound Diffusion (Auto-Thermatic) Ltd.

and Fighting Fires

niques either singly or in combination. In principle, the beginning of an explosion is detected by using methods which enable control action to be taken quickly and reliably before the explosion pressures have time to develop dangerously. Suppression involves the early and rapid distribution of a suppressant which extinguishes the flame and limits the increase in pressure to less than 3 p.s.i. In explosion venting a detonator-operated bursting disc can be used, particularly in systems where normal pressures fluctuate. It is stated that it can be set to operate within ± 3% of a predetermined pressure and is not affected by temperature or subject to fatigue failure.

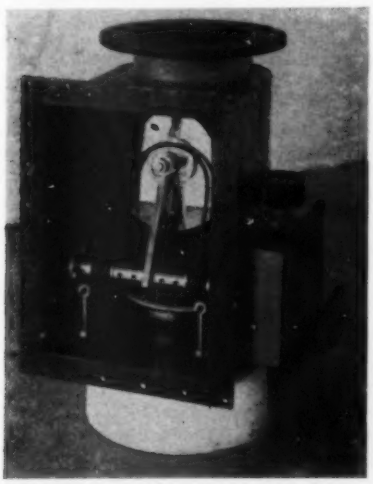
To prevent the propagation of explosions throughout a system it is frequently necessary to isolate very rapidly one section of a plant from another, and for this purpose a butterfly or flap type high speed isolation valve is used. These valves are usually supplemented by a suppressor operated immediately after them to extinguish any flame which might pass through before the valve has closed and this combination is said to give isolation in less than 10 milliseconds.

Advance inerting involves the injection of a suppressant in advance of an explosion flame front to prevent its propagation throughout a plant. The system, basically an electrical one, is self-monitoring and gives audible and visible alarm in the event of a wiring fault and is invariably arranged to shut the plant down automatically should an explosion occur.

These explosion protection methods are often associated with automatic fire extinction systems and this firm are specialists in what are usually considered to be difficult fire protection applications.

Fire alarms

Several alarms are available from the Rely-a-Bell Burglar and Fire Alarm Co. Ltd. The 4 *to* 1 alarm is said to have a loud and distinctive warning note achieved by a robust alarm unit with specially cast gong. The alarm is operated by turning a handle which gives four beats to each revolution and is available in 8 in. and 12 in. dia. gong sizes. For the 12 in., size an effective range of 500 yd. in still air is claimed. The *Link-a-Larm* has been designed for those premises where an alarm is needed on several floors. The alarms are fixed to the wall on each floor and connected by steel shafting through a ¼ in. dia. hole drilled through the floors. The manual operation of any one of these alarms sets the whole system ringing. The company also manufactures the *Reply*-999 automatic gramophone unit which links up a detector or sprinkler system with the local Fire Service. A prescribed message is automatically relayed by the G.P.O. line informing the Fire Service of the outbreak and location of a fire.



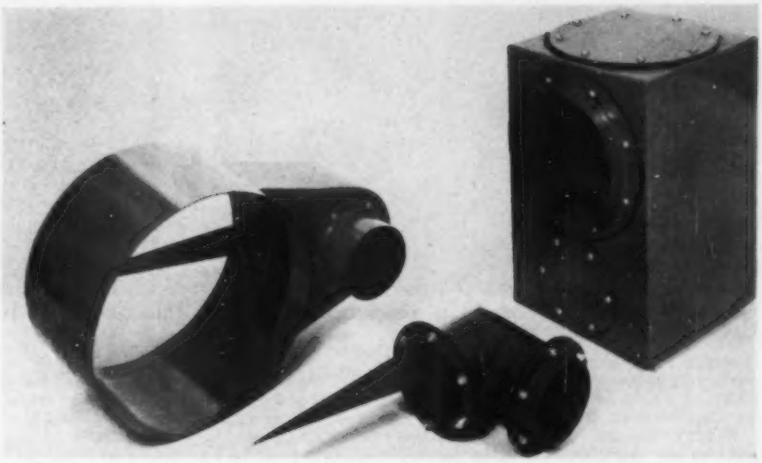
An 8 in. valve made by the Graviner Manufacturing Co. Ltd. for use with their explosion suppression systems. It is stated to close in less than 80 milliseconds.

A more recent development is the employment of the *Truncheon Call*, designed and manufactured by Multitone Electric Co., to work in conjunction with the *Reply*-999 unit. The factory fire guard can be equipped with these and from any point on his patrol can set off the automatic 999 unit by pushing a small button on the truncheon. The Fire Service is then automatically notified, leaving the fire guard to fight the fire with local apparatus.

Fire extinguishers

Fire extinguishers recommended by Nu-Swift Ltd. for general risks in the industry are the 30 lb. dry powder extinguisher, *Model 1630*, and the latest development in the firm's range, the 10 lb. carbon dioxide extinguisher, known as *Model 1510*. Both extinguishers are operated by pressure and work in the upright position.

The large dry powder model is said to be capable, in the hands of an experienced fire-fighter, of extinguishing a 250 sq. ft. petrol blaze in its discharge time of 28 sec. Its range in still air is 25 ft., and the discharge is non-toxic, non-abrasive and non-corrosive. A flush-fitting pressure-gauge shows whether the extinguisher is under sufficient pressure.



Expansion boxes used for inserting in ducts in cooling or ventilating systems. The triangular probe passes a portion of the air flowing in the duct to an expansion chamber housing the Minerva Detector which raises the alarm.

According to the manufacturers the 10 lb. CO_2 extinguisher, *Model 1510*, is leakproof, and cannot be left after use partly charged or leaking; the discharge mechanism has been redesigned so that the range has been increased from the normal 8 ft. to 15 ft. It is claimed that the contents of the extinguisher, normally discharged in 15 sec., will put out inflammable liquid fires of 18 sq. ft. if the fire-fighter is experienced, and of 14 sq. ft. if the fire-fighter is inexperienced.

A foam type extinguisher is available from Romac Industries Ltd. It is designed for safeguarding highly inflammable liquids and is said to throw a stream of foam over 30 ft, and, from a 2 gal. charge, to generate more than ten times its capacity.

A new development from Minimax Ltd. is a steel extinguisher with a polythene lining to minimise internal corrosion. Another feature of these fire extinguishers is a frangible valve which dispenses with the cutter and diaphragm and incorporates a dip-pipe designed to meter the flow of carbon dioxide from the cartridge.

The company's *Power Jet* and *Air Foam* extinguishers can be made frost resistant to operate down to −5°F. It is claimed that the charge in the *Power Jet* model has a greater extinguishing power than plain water and will also retard re-ignition of carbonaceous materials. The *Air Foam* extinguisher has an expansion ratio of 12 : 1 and produces a minimum of 24 gal. of foam. The water/CO_2 and *Air Foam* type of extinguishers are designed so that one person may use two extinguishers simultaneously, or alternatively they can be set in action and left to operate unattended.

The bodies of the dry powder/CO_2 type extinguishers are also polythene coated. Before discharge the dry chemical

Left: the 'Miles Morris Commercial' fire engine available from Alfd. Miles Ltd. Right: the ' Redwing ' fire engine supplied by Carmichael and Sons (Worcs.) Ltd.

powder is aerated to obviate the possibility of blockage and the discharge of gas may be controlled by the operator.

Foam, CO_2 and dry chemical extinguishers are available from Merryweather and Sons Ltd. for dealing with many of the special risks involved in the chemical industry. The firm's extinguishers range in size from the small hand models to the large wheeled patterns designed for use in more extensive premises. For general fire protection in administrative blocks and many factory departments, a wide range of extinguishers employing water is available and hose reels are available carrying rubber hose in lengths ranging from 60 ft. to 180 ft.

Fire alarm systems are also supplied by the company. Of interest to the chemical industry is the provision that can be made for fire doors or fire-proof shutters to close automatically when the alarm system is operated. An automatically operated CO_2 system can be provided so that the affected isolated area can be flooded with gas.

The company also make and install complete hydrant systems, dry rising mains as well as hose and all fittings. In factories where water pressure is normally too low for fire fighting, " booster " pumps can be installed to operate automatically when a hydrant or hose reel is operated.

Fire hoses

BTR Industries Ltd. market an all-synthetic fire and multi-purpose flexible hose called *Plastidry*. Consisting of a PVC cover and lining fused on to a synthetic fabric tube of nylon, Terylene (or a combination of both), to form a strong plastic mass with good wear resistance, the hose is light in weight, and is claimed to be waterproof, water repellent and immune to the attacks of rodents, insects and fungi.

The hose is said to be non-rotting, unaffected by oils, acids and alkalis and will not freeze or support combustion. The manufacturers state that it can be left lying in strong sunlight for long periods without suffering appreciable deterioration in strength and can be exposed to steam or chemically-laden atmospheres without coming to harm.

Available in seven diameters ranging from 1½ in. to 6 in., the hose can be used for carrying any type of water such as salt, or industrially polluted, and because of its tasteless lining may also be used to carry fresh drinking water.

F. Reddaway and Co. Ltd. manufacture *Wypdry*, another plastic hose. This is supported with synthetic fibres and has a thin extruded seamless rubber lining. According to the manufacturers it is light, flexible, easily handled and requires the minimum of maintenance. It is also stated to have good resistance to mineral, vegetable and diesel oils, ammonia, most salt solutions and acid fumes, and to be splash resistant to alkalis, all but the strongest acids and most solvents. It need not be dried after use, although it is advisable to wipe it down to remove any chemical contamination.

Hose fittings available from Motor Trade Machinists Ltd. include a ¾ in. first aid hermaphrodite coupling. Designed to Home Office specifications, it is produced in chromium plated brass and is stated to withstand high pressures. Connection of the coupling is by means of four cams. The company also supply the *Adflow* alloy chimney spray nozzle for dealing with chimney fires, and the *M.T.M.* hose binding machine for use with hoses with diameters of from ¾ in. to 6 in.

Fire engines

In order to meet the demand for the smaller, highly manoeuvrable and yet fully equipped appliance, Alfd. Miles Ltd. have produced a model based on the Morris L.D.2 chassis. The forward crew cabin affords complete weather protection for the driver, and behind him upon full body-width seating, a crew of four. Locker space beneath, and further space behind this seat, provide stowage for light equipment and clothing. Access is by either of the two sliding doors. The rear of the body is enclosed by a pair of folding doors which, when swung back against the sides, reveal the pump and other equipment.

A first aid hose reel, complete with three 60-ft. lengths of hose, is fed from a 100-gal. tank located centrally, while 10/12 lengths of delivery hose are located in a rack to the rear of the tank. Suction hose is housed in tunnels beneath the floor and a roof gantry carries a light extension ladder.

On road test during which the appliance carried full equipment including 1,000 ft. of delivery hose, 100 gal. of water and a crew of four men of a total weight of 3 tons 3 qrts. 2 lb., it is stated that the average acceleration was 0-40 m.p.h. in 37 sec. The vehicle has a turning circle of 36 ft.

Carmichael and Sons (Worcs.) Ltd. have recently introduced two new fire engines. The first of the new models is the *Carmichael-Leyland Firemaster* with a chassis by Leyland Motors and a power unit of 150 b.h.p. This power unit is carried below the chassis frame. At the front of the engine is a power operated gearbox to drive two front mounted pumps, one of low pressure maximum volume, and one of high pressure. The transmission is semi-automatic. The company are providing three types of fire engine. They are (*a*) the water tender; (*b*) the dual purpose appliance; (*c*) the turntable ladder.

The second model is a small 4-wheel drive *Redwing* fire engine. It has a first aid system, one hose reel and a 75 gal. tank. The main pump has a capacity of 250 g.p.m. and, it is claimed, can support two heavy jets at 100 lb. Up to 800 ft. of 2½ in. hose is carried, and a crew of five. This machine is available with CO_2 and dry powder extinguishers.

Fire proof construction

Asbestolux, a non-combustible asbestos insulation board, manufactured by Cape Building Products Ltd., consists mainly of amosite asbestos fibres and a selected grade of silica, both of which are inorganic and chemically inert. It is formed by a chemical bond which takes place in a high-pressure steam oven and is claimed therefore not to suffer from the brittleness and alkalinity normally associated with cement-bonded asbestos boards.

The product is used as a constructional material for the lining of roofs in factories, power stations, chemical plant, *etc.*, and as wall and ceiling linings in laboratories, *etc.* When fitted to the roof of an industrial building in accordance with the company's specifications the lining is stated to fully comply with the requirements of the Thermal Insulation (Industrial Buildings) Act, 1957.

Quitfire is an impregnation process claimed to render fibre insulation board and perforated acoustic fibre board non-inflammable in Class 1 in accordance with B.S. 476/53 (Revised). The manufacturers, S. O. Rudkin and Co. Ltd., state that the thermal conductance value of the treated board remains within British Standard, while the process does not essentially impair the physical properties of the board.

It is claimed that in a fire the protective substances, which are confined to just below and above the surface, melt and penetrate into the interior of the board, so that the fire generates its own source of resistance. Under normal conditions the board is said to retain its fire-resisting property indefinitely.

A range of self-closing fireproof doors is available from Haywards Ltd. Features of these doors are selector gear for pairs of doors which ensures correct closing sequence of the door leaves when they are released by a fusible link device (normally set to operate at 155°F.); a braking device said to hold the leaves in any desired position before the fusible link comes into action; and enclosed helical hinges with oil baths, eliminating the need for springs or quadrant tracks and wheels. The whole door assembly is within the area of the door frame, a feature which simplifies construction and reduces initial costs.

Flameproof electrical system

The General Electric Co.'s air pressurised electrical system has been devised to make possible the use of mains-fed electrical equipment in situations where hydrogen (representing also town's gas, coke oven gas and blue water gas) is present. Hydrogen is scheduled under Group IV in B.S. 229 as one of the "Excluded gases and vapours" for which the use of standard flame-proof equipment is prohibited, since the maximum safe gap for these gases is too small to be practicable or to justify flame proof certification on the basis of type tests. It is probable that from time to time the pressurised system will be approved for other gases and vapours within the Group IV classification.

The system is intended to be applied to lighting installations, or to any other type of equipment which is suitable for pressurisation at ¼ lb. per sq. in. or more, and incorporates an intrinsically safe control circuit operated by pressure switches placed at suitable positions (at intervals of, say, 15-20 ft.) in the installation, which in the event of loss of pressure isolates the installation from the source of electrical supply. Since the control circuit is intrinsically safe, it can remain energised irrespective of whether pressure is present or not throughout the installation. The control circuit cables and the air under pressure are contained within the conduit installation carrying the main supply cables.

The equipment consists essentially of (1) a pressure switch, (2) a means of separating the pressurised section of the installation from the remainder, *i.e.* a barrier box, and (3) a control unit incorporating the intrinsically safe source of power (an intrinsically safe transformer) and its associated contactor for isolating the installation. It is said to be impossible for the main contactor to close until and unless the whole system is properly pressurised. Provision is made for a "latch-off" pressure switch to be inserted adjacent to the main incoming air supply. The function of this switch, which is supplied with a padlock to prevent unauthorised interference, is to ensure that once the pressure in the system has been lost for any reason the installation can only be put into service again by a responsible person. An external bell can also be connected to give warning should the main contactor remain closed when air pressure is lost.

The harness which allows the Nife caplamps to be used also as chest lamps.

The control equipment is available in two forms, the first being suitable for use where it can be mounted in a "Safe" area adjacent to the hazardous (hydrogen) area, and the second (in flameproof certified form) for use where it must be mounted in a Group II or Group III area.

For lighting circuits, On/Off push-button switches of a type suitable for pressurising are available to provide local control.

Portable lamps

The range of hand, head and portable lamps made by Nife Batteries Ltd. for fire-fighting duties includes hydrogen cap and hand lamps which are stated to meet the requirements of Home Office specification J. C. FF/21, covering lamps for use with breathing apparatus. Providing a penetrating beam of light, it is claimed that they will burn for upwards of 10 hr. on one charge. By means of a harness the cap lamps may be worn attached to the chest as well as on a helmet. The *NG*-7 accumulator hand lamp also has a Factory Department certificate of safety for use in hydrogen, towns' gas and petroleum vapour.

The *S*-6 portable searchlight is said to supply a beam of light equivalent to that of a motor-car headlamp. Fitted with a dual filament bulb, it gives 3 hr. continuous light on the 3 A. main filament, or 20 hrs. on the reserve filament. A portable floodlight set is also produced. The battery is housed in a welded steel box with hinged lid and carrying handle. An adjustable standard attached to the box carries the light unit, enabling it to be swivelled in any direction and used at various heights. According to the manufacturers it can be recharged at high rates in an emergency and is capable of standing unused, for years if necessary, and will still produce a light instantaneously when required.

An all-purpose inspection lamp, the *NH* 10-A hand lamp, is of sturdy construction and is fitted with an anti-flicker switch and focusing device. It can provide either a beam or a spread of light.

The cells in Nife batteries, both containers and plates, are made of steel and are said to have active materials and an electrolyte that are completely stable.

Protective boots

A feature of the *Firetread* rubber boot, made by B. T. R. Industries Ltd., is a tempered spring steel mid-sole anchored by a new bonding process from waist to toe between the insole and the outsole. This flexible mid-sole is said to afford a high degree of protection to the sole of the foot, preventing injuries caused by treading on unseen nails, glass or other sharp objects. The boot also provides protection against crushed toes. Dimensions of the boot are stated to conform to BSS 2781: 1956 and of the steel toe-cap to BSS 953, Grade 1.

HOW TO PREVENT FIRES IN CHEMICAL WORKS

(*Concluded from page 64*)

Research Organisation of the Department of Scientific and Industrial Research and Fire Offices' Committee; the paper is published by permission of the Director of Fire Research.

BIBLIOGRAPHY

List of hazardous goods. *Fire Offices' Committee Fire Protection Association.* No. 28. London, 1955.

Industrial solvents and flammable liquids. *Fire Offices' Committee Fire Protection Association* No. 24. London, 1954.

Code for the storage and use of highly inflammable liquids. *Association of British Manufacturers. Safety Circular* No. 97. London.

Storage of petroleum-spirit. *Fire Offices' Committee Fire Protection Association.* No. 32. London, 1957.

Repair of drums or tanks: explosion and fire risk. *Ministry of Labour and National Service. Factory Department. Safety Pamphlet* No. 18. London, 1952. H.M. Stationery Office.

Inflammability of dusts. *Ministry of Labour and National Service. Factory Department. Form* 830. London, 1953. H.M. Stationery Office.

Notes on the installation of plant for the grinding of inflammable materials. *Ministry of Labour and National Service. Factory Department. Form* 896. London, 1950. H.M. Stationery Office.

Electricity and the fire risk in industrial and commercial premises. *Fire Offices' Committee Fire Protection Association* No. 30. London, 1957.

P. A. Cubbage, and W. A. Simmonds. An investigation of explosion reliefs for industrial drying ovens. I. Top reliefs in box ovens. II. Back reliefs in box ovens: reliefs in conveyor ovens. *Gas Council Research Communications* GC 23/1955 and GC 43/1957.

Safety in the design and operation of gas heated ovens and furnaces. *Ministry of Labour and National Service. Factory Department. Form* 1856. London, 1955. H.M. Stationery Office.

Fire risks in the fabrication of plastics. *Fire Offices' Committee Fire Protection Association.* No. 20. London, 1953.

Memorandum on precautions in the use of nitrate salt baths. *Ministry of Labour and National Service. H.M. Factory Inspectorate. Form* 848. London, 1948. H.M. Stationery Office.

Fixed fire extinguishing equipment in buildings. *Fire Offices' Committee Fire Protection Association.* No. 36. London, 1958.

Non-Irritant Depilatories

By T. A. Ruemele,* PH.D.

THIOGLYCOLLATE depilatories are more acceptable products than the older sulphide hair removers. But even these, like all depilatories, tend to irritate the skin, depending on the sensitivity of the individual. Hence the warning that depilating treatment should be stopped immediately at the slightest sign of irritation. It is partly because of this that depilatories are used predominantly on the legs and arms and generally are not recommended for the face, although there are a few products that are claimed to be suitable for use on the face, provided a soothing cream is used afterwards.

Recently two suggestions were put forward for minimising the irritant property of depilatories. In both cases an antiseptic is incorporated in the depilatory, namely 8-hydroxyquinoline sulphate and hexachlorophene (German Pat. 965,920 and U.S. Pat. 2,823,168 respectively). The former antiseptic is incorporated in a sulphide preparation (strontium sulphide), the latter in a calcium thioglycollate depilatory, said to be specially suitable for pre-operative purposes.

The skin may benefit from the use of antiseptics, but whether they can prevent allergic reaction has yet to be ascertained.

Investigating this problem the present writer felt that to eliminate the irritant from depilatories an anti-allergy agent should be incorporated. 1,4 Dimethyl-7-isopropyl azulene ($C_{15}H_{18}$), the blue colouring matter of chamomile, is recognised for its antiphlogistic, regenerative and anti-allergic activity, so it was decided to employ it as the anti-irritant (Patent appl.) and subject it to stringent tests by incorporating it in a powerful depilatory formula which, because of its strength, alkalinity and consequently very quick action, would normally produce extensive irritation on sensitive skins, *e.g.*

	%
Reducing chemical	7·0
Alkaline chemical	9·9
Emulsifier	15·0
Azulene	0·25
Water	67·85

Clinical tests included depilating treatment of the legs and arms and even on fairly long exposure no irritation occurred. Subsequently, over a hundred tests were carried out on the face, again without signs of irritation. Several of the subjects in this test had previously experienced irritation from the use of a depilatory. Finally, tests were made with a deodorant, which was applied to the skin immediately after the depilating treatment, a procedure strongly deprecated in the normal way. Here too, no adverse effect was produced.

These results indicate that azulene makes depilatories safer to use and, because stronger formulations may be employed, quicker in their action.

The writer is indebted to the directors of Pharmax Ltd. for the permission to publish this note, and thanks Dr. G. E. Hesketh, medical consultant to the firm, for the performance and assessment of the clinical tests.

* Pharmax Ltd.

New Laboratories in Edinburgh

THE main part of the extensions to the chemical laboratories of Duncan Flockhart and Co., Edinburgh, which were opened recently (see *M.C.*, December, p. 535) consists of additional facilities for process development and study. New laboratories provide accommodation for at least eight chemists and their technical assistants. The head of the development section has an individual laboratory and a larger laboratory has been sub-divided by a glass partition in order to provide two self-contained laboratories. A full range of services is carried on the benches and the controls and outlet points, which are clearly marked by labels, are mounted on panels on the central structure which also serves as reagent shelves. This arrangement provides a relatively large working space.

Drainage is by means of glazed earthenware troughs leading to an effluent system constructed in *Vulkathene*, a removable *Vulkathene* bottle trap being interposed between each sink and the piped system. At the window end of each bench provision is made for writing space and book shelves for each chemist.

Fume cupboards are provided down one side of the laboratory, the ducting being large bore asbestos connected to a *Lithcoted* fan located on the roof. The draught to each set of cupboards can be adjusted. Heating is provided by high level unit heaters fed from the 30 p.s.i. steam main, fans being brought into action by thermostatic control, thus avoiding the problem created by low level radiator systems. There is a separate balance room at constant temperature next to the main laboratory.

The benches are built of wood, with teak working surfaces. After careful consideration of flooring materials it was decided to use linoleum tiles. A warm red colour was chosen to contrast with the cream paint and stainless steel fittings.

New buildings on the roof of the block include, in addition to the ventilating fan room, a fireproof laboratory of concrete and glass brick construction for conducting potentially hazardous experiments, an open-air bench under a concrete canopy for carrying out unpleasant operations on a larger scale than possible in fume cupboards and a well-ventilated store for chemicals which give rise to corrosive fumes. The working spaces on the roof. including the outside bench, are warmed by radiant steam panels.

Pilot plant. On the ground floor, pilot plant has been regrouped and extended. In addition to a line of steam-jacketed enamelled sulphonating pots of 5-20 gal. capacity which serve as reaction vessels and stills, a separate space has been fitted up for final stages of purification providing for filtration, drying and grinding under clean conditions with a filtered air supply. In addition to general purpose equipment for filtration and separation, sub-sections are set apart for hydrogenation and vacuum distillation. The whole area is flameproof, any non-flameproof equipment such as vacuum pumps and thermostatically controlled oil-and-water circulating systems being located in a separate section.

These extensions enable more space to be devoted to research

(Concluded on page 72)

PERFUMER'S ODYSSEY

By Steffen Arctander

Essential Oils of the Belgian Congo—2

In the first part of his article, which appeared last month, Mr. Arctander described the beginning of his tour and dealt with the production of eucalyptus oil. Here he describes the Parfums du Kivu organisation and the production of eucalyptus oil, geranium, vetivert and lemongrass.

SHORTLY before my arrival at Goma at the Kivu Lake, I had to pass through another of these fabulous tropical thunderstorms, which within a few minutes, turn the track into a small river and stop just as suddenly as they arise. Within an hour everything is quiet and sunny again. Finally, I was in Goma, the place that I had heard so much about during my three-year long preparations for this trip, and still Goma itself surpassed by far, the descriptions I had obtained. Like a southern European mountain city in a tropical frame with the climate of a resort place; vegetation as Italy and Africa combined; and nature as grand as is hardly found anywhere else; a deep, deep blue lake with wonderful sandy beaches; a wealth of flowers and trees; mountains and volcanoes, rising as a frame around the blue lake; a clean and healthy, orderly city with wonderful villas; this was Goma, probably the only spot offering so many distractions in its nature and such a pleasant and healthy climate that even the Belgian officials often prefer to go to the Kivu District rather than back to Belgium during their long, but rare vacations.

Grinding washed vetivert rootlets at M. Legast's distillery in Parkivu, Goma, Eastern Belgian Congo.

Les Parfums du Kivu

In a beautiful Swiss-style villa, I found M. Etienne Legast, the man behind "Les Parfums du Kivu." Photographs can probably better tell than words about his house and his factory. In a separate section of Goma, the factories are forming quite an industrial city. It is widely separated from the private homes and the native quarters. Legast himself was an architect, mason, lumberman, engineer, etc., when in 1953 he arrived with his family. Today, he can look back with rightful pride upon five years of hard work and the result thereof. But this is only a beginning. The spirit of the settlers is invincible. A series of accidents occur now and then and it demands more than a normal amount of will-power to carry on after such misfortune. Recently, Legast crashed his brand-new car against a truck which ran on the wrong side of the road in a hair-pin curve in the mountains. Legast and his passenger, Dr. Ernest Guenther from the U.S.A., fortunately came out almost unhurt, but his car was a total wreck. Shortly after this, Legast was hit by another accident when a fire broke out in the department of his factory in Goma where he distills vetivert oil. The stills were saved, but there was extensive damage to his stock of vetivert root and the buildings. This is mentioned in order to give some idea of the difficult conditions under which work has to be done, disappointments overcome, damage repaired, etc. Here, thousands of miles from the nearest sea port, the problem of supply is a big and a heavy one.

Very excellent products are turned out from this factory. The main disadvantage of these oils or this production is that the production is too small to obtain sufficient influence on the world market. It is not quality that is lacking. Vetivert oil and geranium oil are produced in respectively little more than 1 and little more than 3 tons annually against earlier 3 and 16 tons in the good years 1950 to 1951. Eucalyptus oil "pharmaceutical" runs into about 30 tons a year and so does lemongrass oil, which nowadays far from obtains the price at which it was sold a few years ago. The production of lemongrass oil has, however, now been rationalised and one can foresee an annual production of at least 50 tons of this important

material. The production of eucalyptus citriodora has increased to 15 tons annually and is still increasing. Leptospermum citratum has lately gained an enormous interest and the demand is increasing; cultivation has increased from 5 to 15 hectares, and the plantations are being extended. The production, however, is still around 2 or 3 tons per year, but will increase slowly with the very slow-growing shrubs.

Experimentally, there were produced a couple of years ago, petitgrain, bigarade and niaouli oil, especially in the north near Uele District near Niangara, but the production of these oils has now been abandoned. So, let us take a closer look at the oils which have survived the first difficult period and which seem to have caught and retained interest among the customers.

Crude distillation of E. Smithii on M. van den Heuvel's plantation. With the exception of French North Africa this is the largest still in Africa and treats 7 tons of leaves per batch.

Eucalyptus Smithii

—also called Eucapharma—is now produced in a steady quantity and seems to easily find outlets as long as the price is kept in competition with the Spanish, Portuguese and Australian oils. Together with M. Legast, I visited some plantations and distillation installations, among these, the largest one in the Belgian Congo, belonging to the Belgian M. van den Heuvel. He is, by the way, one of the most ardent enthusiasts for the cultivation of perfume plants and has worked hard towards this end. He had constructed his stills himself in the bush in the Mokoto District, about 45 miles north-west of Goma. His largest still for eucalyptus leaves could treat 7 or 8 tons of material at one time, and the yield was about 220 lb. per batch. The crude oil was most often rectified on the spot in another still, the 12 ft. column of which yields sufficient separation so that Van den Heuvel could produce on his own premises a eucalyptus oil which conformed to the pharmacopœia demands. The terpenes as surplus from the rectification of eucalyptus oils were mainly used in the paint and lacquer industry as a solvent. Leaves and twigs from eucalyptus Smithii were brought in on trucks on privately-constructed jungle roads and tracks and down a steep slope and were literally slid directly into the large concrete still vat, a concrete cylinder about 20 ft. in diameter. Two steam generators blew jets of steam from below through a screen and a wooden lid was fixed to the top of the concrete cylinder and tightened with mud and straw as packaging materials. Water for the condensers was taken from the small mountain streams and is usually present abundantly. Exhaust plant material is spread around the place and dried in the sun and later used as fuel for the boilers.

A number of other plantations in this district produce eucalyptus smithii. They distil the crude oil and part of this crude oil was rectified on modern installations in Goma at M. Legast's factory. No eucalyptus oil was exported without the approval of OPAC laboratories in order that they conform to the conventional demand from the pharmacopœias. Rectified oil of eucalyptus Smithii is water-free, free from aldehydes, and conforms to the U.S.P., the B.P. and other pharmacopœias. Even on the hand-made rectification still in the jungle, a sufficient separation of the lighter aldehydes and other unwanted constituents is obtained, and one cannot help admiring the results achieved here with tools and apparatus which would most probably turn any European or American producer grey with despair.

Eucalyptus dives

—is distilled only in moderate quantities and has earlier found extensive use and interest because of its high content of piperitone, basic material for the production of synthetic menthol. The oil is also used in the mineral industry, but the production of the oil has not obtained a great popularity among the settlers.

Eucalyptus MacArthuri

—another " small oil " which, however, deserves some attention. Because of its very high content of geranyl acetate, this oil could prove to be more interesting than many other eucalyptus oils. Geraniol, produced by the saponification of this oil, possesses a particularly fine, rich and round body but cannot compete economically with other geraniols. Eucalyptus Macarthuri oils with more than 60% geranyl acetate are not uncommon and a steady increase in the content of this ester has been obtained through cultivation under certain circumstances.

Geranium oil

Pelargonium Odoratissimum imported from France is cultivated to a modest extent especially in the mountains east of Goma, toward and in the Province of Ruanda around Byumba, etc. Together with M. Legast, I visited some large modern distilleries situated in the middle of the geranium fields at an altitude of 5-6,000 ft. Since the good years, 1950 to 1952, there has been a considerable decrease in interest. Plantations have been abandoned and others neglected and the yield has gone down. The good old prices

are obtained no longer, but the interest in geranium seems to have returned now and several settlers have not only reconsidered their plantations but also tended the plantations and started quite new ones. The annual yield has increased from the minimum of about 1 ton, reached in 1956, to a foreseen production of 3 tons in 1958. OPAC laboratories have set up the following strict norms for an export quality of geranium oil:

1. The oil must be free from water and contain a maximum of 0·3 g. of insoluble impurities per litre.
2. The oil must be free from copper.
3. Physical constants: specific gravity at 20°C., 0·880 to 0·915; optical rotation at 20°C. from −7° to −14°; refractive index at 20°C., 1·460 to 1·474; solubility in 70% per volume of alcohol, one volume of the oil soluble clearly in 3·5 volumes of alcohol or less.
4. Chemical constants: acid index from 0 to 13; ester number between 45 and 81; acetyl index between 200 and 214.
5. Alcohol calculated as citronellol or rhodinol so-called over 40% for oils labelled as geranium Congo 1; 30% to 40% for oils labelled as geranium Congo 2.

Pelargonium odoratissimum

—has a pronounced tendency to hybridisation, and under the changed climatic conditions and in the special soil in the Belgian Congo, it may not be so strange that the Congo geranium oil deviates substantially from the Algerian and the Reunion oils in regard to its content of the so-called rhodinol. Most perfumers know, on the other hand, that the effect of a geranium oil cannot be based upon its content of rhodinol. Numerous other small quantities of materials in the geranium oil contribute to its character and also to its power. Besides, it also depends upon the purpose for which one wants to use the geranium oil whether the Congo or Algerian or Reunion oils will be suitable for the purpose. There are still more qualities and it probably is suitable here to mention that both Angola and Tanganyika have experimentally produced geranium oil. In Angola, furthermore, it is a man with a life-long experience in the field, Herr Alfons M. Burger, who on his own extensive farms, has cultivated a long row of perfume plants and

Geranium distillery in the Byumba region, east of Lake Kivu, Belgian Congo.

distilled them on his own modern distillery. Nobody would demand or expect that a Congo geranium oil should be a replacement for Reunion geranium oil, but as long as the Congo geranium oil is constant in its quality, it could just as easily go into a production as any other perfumery raw material. It becomes a raw material, not a replacement. But this sort of philosophy I will leave to the readers, to the consumers, to the perfumers when they have seen, smelled or used these oils. Finally, one should not be blind to the fact that it is economically a sound policy to encourage one or more markets for a certain merchandise to avoid monopoly. In many cases, it will prove possible or advantageous to use another type of geranium than the conventional and thus, we have started the sound competition which is for the benefit of us all.

Vetivert oil

In the mountains around Lake Kivu, especially towards the east, vetivert grass is cultivated; in other places, it grows spontaneously but is not exploited in all places for the distillation of the rootlets. It is worthwhile mentioning that all root material is bought up by one distiller, M. Legast in Goma, and only he has a sufficiently modern distillery which can profitably produce this oil. This gives us security of a constant quality, and personally I can add that this quality is above the average of what is offered from other sides. As the price is advantageous, the Congo vetivert oil should have a good future. Often the shipment of vetivert oil is carried out by air mail. This is one of the very few oils whose economy can bear it. In one end of M. Legast's factory in Goma, we find a high, spacious still hall where a very modern stainless steel still is at hand. After his own sketches and design, M. Legast had this apparatus made in Belgium and Germany. With much trouble and endless patience, he had the apparatus shipped to Goma, which took months. The boiler, which was heated by an air-jet stream from burning coffee-bean shells from a neighbour, who is a coffee-bean rinser, yielded up to 12 atmospheres pressure. Using this high pressure, Legast could distil vetivert root to a complete exhaustion within 16 or 18 hr., while on native field distilleries in Java or Reunion Island or elsewhere, up to 36 hr. can be necessary. The yield from Legast's apparatus was about 2·4% of an oil with an optical rotation of about +18°. The OPAC laboratory demands a norm for the export of vetivert oil from the Belgian Congo as follows:

1. It must be free from water and contain less than 0·3 g. of insoluble impurities per litre.
2. It must be free from copper.
3. Specific gravity at 15°C., 0·990 to 1·040; refractive index at 20°C., 1·520 to 1·528; soluble in three volumes of alcohol of 80%.
4. Saponification index between 14 and 45.
5. Optical rotation at +20° for Congo 1, minimum +20° rotatory; for Congo 2, +15° to +20° rotatory; acetyl index for Congo 1 is 130 minimum; for Congo 2, 110 to 130.

Legast furthermore produced experimentally vetivert resinoid, a sample which I received proved to be of extraordinary interest. We have in this a material with high fixative value at a very reasonable price, allowing its use at places where we would hesitate to use vetivert oil. It will be interesting to see whether this new

Rectification on locally constructed columnar still at M. van den Heuvel's plantation, Mokoto region.

raw material will become a popular article during the years to come.

The vetivert root arrives in Goma from plantations from perhaps 60 miles or more away, and in Legast's factory it is coarsely ground and distilled. Roots from sandy soil appear to give a very good oil. This root is very light coloured, straw-yellowish, and gives a powerful well-rounded perfume oil of the Bourbon type. The annual production has been 1 ton in 1956; in 1957 900 kg.

Leptospermum citratum

—also called tea tree oil, after the tea tree which Captain Cook in 1772 found in Australia and used for preparation of a beverage for his crew. The shrub has been imported into East Africa and is cultivated in Uganda, Rhodesia. Congo and several other places, It grows very slowly, and its leaves are small and narrow.

The settlers have not been very interested in such cultures, but as the oil from the leaves proved to be highly interesting they have now speeded up the cultivation of this plant. With its citral content of about 50% and about 35% citronellal, some 10% of terpenes and a few per cent of esters, such as geranyl acetate, etc., this oil offers really unique effects as a perfumery raw material. These contents, however, immediately place the oil in a class with the so-called cheap soap perfumes, but no other oil possesses this special effect. Penfold described it about 40 years ago and other scientists have mentioned it even earlier. With the increasing interest, we still have to be patient with nature. It will still take many years before the production of this oil reaches such quantities that the leptospermum citratum can threaten other aldehyde-containing perfume oils. We have, as mentioned, no oil other than leptospermum citratum containing this special combination of citral and citronellal, and it seems beyond doubt that an increasing production will stabilise the price and make this oil still more interesting. It will largely be up to the clients to decide this.

Lemongrass

—is the only perfume plant in the Belgian Congo which can be cultivated in the lowlands, that is, close to the big rivers. All the other perfume plants that we have mentioned are cultivated in 5,000 up to 8,000 ft. altitude but lemongrass needs a moist lowland as we find it in central and western Belgian Congo plains. The main centre of production, however, is in Obokote where a large Belgian company has centralised the production and distils the oil on the spot. Also, rectification takes place locally and it is thus very common to find Congo lemongrass oil with over 80% or even 85% citral. I have met with samples containing 92%, but in such cases the price of the product is, to a certain extent, corrected according to the content of aldehyde. The foreruns from the rectification, especially methyl heptenone can, as it will be known to the readers, through recently developed synthesis, be changed into ionone, and there are even methods of synthesising this material that start all the way back from acetone, completely avoiding the natural citral, earlier key material for the production of ionone. Vitamin A is no longer produced to the same extent by the earlier method through citral - ionone - carotin. In other words, we can now avoid natural citral for the process and accordingly, lemongrass oil will slowly fall back to its original field; perfumes. This will, undoubtedly, stabilise the price so that the consumption in the perfumery industry will rise once more. The vitamin industry and commercial speculators some years ago pushed the price to such heights that no manufacturer of soap perfumes would use lemongrass oil, but it seems that we can now again enjoy a sound development and yet increasing production of lemongrass oil. The employment of the foreruns of lemongrass oil offers, furthermore, advantage for the customers in the fact that the price becomes more attractive even for oils with very high content of citral and the stability is likewise increased. With an expected crop of 50 tons of lemongrass oil, this perfumery material will now become the largest one in the Belgian Congo as far as quantity is concerned.

NEW LABORATORIES IN EDINBURGH

(*Continued from page 68*)

on new drugs and also to development work on pharmaceutical formulation.

Biological laboratories. Extensions have also been made to the biological laboratories which are located separately from the chemical laboratories. An old building, formerly used as a laundry and canteen, has been adapted for laboratory purposes, three individual laboratories for pharmacology having been set up on the first floor, together with a service room, dark room and instrument room. The laboratories are intended to be as flexible as possible and have relatively small fixed bench provision, leaving space for operating table and recording instruments, power for which is carried overhead. Provision is made on the ground floor for kennels, an animal room for chronic toxicity trials and a workshop.

DISINFECTANTS and Disinfection

By A. H. Walters, F.I.M.L.T., M.R.S.H., M.I.BIOL.

Microbes measure hormones • Bacteria in eye ointments • Sterile talc • Preservatives • Interferon • Plastics and microbes • Surfactant-iodine germicides • Sheep pelt bactericides • Sorbitol and boric acid • Bacteriostat losses from injections • Fungi in tolu syrup

Microbial assay of hormones

MANY of the present methods for assaying hormones are cumbersome, so an attempt has been made to develop a microbiological assay.[1] The inhibitory effects of some œstrogens on micro-organisms is well known, *e.g.* the inhibition of *Esch. coli* by dihydrofoliculine. In the present tests, initially various hormones were dissolved in ethylene glycol and the solutions were put on paper discs placed on the surface of agar media previously inoculated with the bacterial species to be tested. After incubation the plates were examined for inhibition zones. Using staphylococcus strain (H) negative results were obtained for pregnanediol, œstrone, œstradiol benzoate, progesterone, testosterone, androsterone, cortisone, DOCA, adrenaline, cholesterol, but it was found that this organism was strongly and specifically inhibited by diethylstilbœstrol. Plates were poured with a 10 ml. base layer of agar and with 4 ml. of nutrient agar seeded with a 6-8 hr. nutrient broth culture of *S. aureus*. Older cultures produced less uniform inhibition zones. Parallel assays in bouillon produced similar sensitivity indications.

The authors suggest that similar measurements might be used for a variety of substances. A micro-organism displaying a specific response to any agent may serve as an assay organism even if dose response relationships are non-linear. Provided threshold concentration levels are well defined, the means are at hand for developing precise assay methods for hormones and other substances.

Bacteriological content of ophthalmic ointments

Reference has already been made to the importance of bacteriological control of solutions used for instillation into the eye (MANUFACTURING CHEMIST, 1957, **28**, (5), 242), and now comes a bacteriological study of ophthalmic ointments.[2] The purpose was to examine bacteriologically 83 ophthalmic ointments commercially available in the U.S. and also to attempt the production of sterile ophthalmic ointments by incorporating antibacterial agents.

Tubes containing 3·5 g. of ointment were first immersed unopened for 1 hr. in benzalkonium chloride solution. Under aseptic precautions the contents of the tubes were squeezed in 25 ml. amounts of sterile distilled water at 45°C. and agitated for 1 hr. at room temperature to disperse. Then three 1 ml. amounts were pipetted into three petri dishes, melted blood agar added, mixed, and when set incubated at 37°C. for 24 hr. The number of bacteria per gram of sample was calculated by multiplying the colonies counted by 25 (original dilution) and dividing by 3·5 (original gram weight).

Results showed that of 83 ointments tested, 12 were sterile, 52 had less than 50 organisms per gram, and 19 contained between 50 and 250 organisms per gram. Of 28 antibiotic ointments tested, 11 were sterile, 15 contained less than 14 organisms per gram, 1 containing procaine penicillin had 64 organisms per gram, and the last, containing erythromycin, 129 organisms per gram. Of nine sulphonamide-containing ointments 1 was sterile, and the remainder had less than 36 organisms per gram. None of the 21 mercurial ointments was sterile and counts per gram ranged between 14 and 121. Of four cortisone or hydrocortisone ointments none was sterile but each had an identical count of 14 organisms per gram. Six boric acid ointments (5% and 10%) contained between 14 and 136 organisms per gram, and a miscellaneous group of 15 contained between 7 and 243 organisms per gram.

A second experiment was made using one common ointment base into which benzylkonium chloride (1 : 1,000), chlorbutanol 0·5%, benzyl alcohol 0·5%, chlorobutanol and benzyl alcohol both at 0·25% were incorporated. The base alone was tested as control. These ointments were heavily infected with *S. aureus* and tested as previously described within 8 hr. The best results were obtained with benzyl alcohol (99·6% kill). Following this 0·5% benzyl alcohol was incorporated into six ointments, namely yellow mercuric oxide 1% and 2%, boric acid 5% and 10%, cortisone acetate 1·5% and penicillin G potassium 1,000 units per gram. All these were tested for bacterial content against parallel commercial samples. None of the commercial samples were sterile, counts varying between 11 and 79 organisms per gram. Of the laboratory prepared samples containing benzyl alcohol six were sterile and one (2% mercuric oxide) returned a count of 7 organisms per gram.

The standards set by these workers are commendably high. It would be interesting to know what types of organisms were recovered, and whether any anaerobes were present. A first-rate, easily read paper.

Sterilisation of talcum powder

The recommended B.P.C. method for sterilising talc is to maintain

the bulk at 150°C. for 60 min. Work has now been done to ascertain the time required to bring a talc mass up to that temperature, and to confirm the efficacy of the sterilising process by noting the effect on spore bearing contaminants.[3] The problem is truly one of heat transfer which must, from the practical viewpoint, devolve on the size of the talc container. Cylindrical aluminium containers of different diameters were packed with talc and carried a thermocouple at the centre. Other thermocouples were suspended inside the ovens used. Tests were made at oven temperatures of 150° and 160° noting the size of the container, the time taken to reach 150° and the time lag between the air heat of the oven equating with the temperature in the centre of the talc masses. From results obtained it was concluded that if the oven works at 150°C. the time lag may be such that the material may never reach sterilising temperature. The lag appears to vary with the rate of heating of the oven. Where the oven reached 150° in 30 min. the lag was 45 min. for the 5 cm. tin, whereas when the oven took 60 min. to reach 150° the lag was 15 min. Spore-contaminated talcs showed no growth after heating at 150° for 50 and 60 min., but some growth was obtained when the maximum temperature was set at 140°.

The authors recommend that talc should be packed in small metal containers, preferably less than 2 cm. in diameter. The oven should reach at least 155° and after this 20 min. allowed for the material to attain this temperature before sterilisation time commences. If the oven reaches 155° in less than 40 min. the sterilisation time should be increased. In all, a true temperature of 150° in the talc mass for 60 minutes seems adequate to sterilise.

Antimicrobial preservatives

A symposium on antimicrobial preservatives was held under the ægis of the Society of American Bacteriologists and an excellent report on the papers read has been issued.[4] The symposium was concerned only with the rôle of the microbe in producing destructive changes in drugs, food, cosmetics, textiles, etc., and the part played by antimicrobial preservatives in preventing such changes. The sponsors hoped that knowledge exchanged by experts in this field would result in more active and non-toxic compounds being made available and better use being made of these in use at present.

In the section on preserving pharmaceuticals a distinction was drawn between performance requirements and testing methods to be used for parenteral products and oral medicaments. In the absence of an official testing method, each manufacturer is responsible for the validity of the method employed. The author (Dr. Grundy) describes the test used by his Company, pointing out that a satisfactory preservative must at least inhibit spore forms and moulds.

Dr. Gooding reviewed the need for food preservatives and traced their development from brine, vinegar, spices, alcohol and wood smoke to benzoic acid and its salts, propionic acid, sodium diacetate, sorbic acid, and so on.

Mr. de Navarre discussed preservatives in the cosmetic industry with special reference to interference with their action by non-ionic emulsifiers. With the exception of the *Carbowaxes* there appears to be a relationship between ethoxylation and inactivation.

Dr. Bartram reviewed the legal aspects of preservatives in foods, drugs and cosmetics.

Dr. Block dealt with the use of preservatives in wood, textiles, leather, paint, glue, paper, plastics, electronic and optical equipment, petroleum and masonry. Because of the wide diversity of uses and dissimilar materials to be preserved, it is impossible for any one compound, or even chemically related compounds, to serve all applications equally well. Preservatives for wood include creosote, pentachlorophenol, copper naphthenate, zinc chloride, copper sulphate and sodium fluoride. Cellulose textiles are preserved by copper naphthenate, copper-8-quinolinolate and salicylanilide. Leather is assisted by paranitrophenol. To prevent decomposition of protein based paints sodium pentachloride has been used, while in the oleoresinous paints organic mercurials are effective. For preserving glues, pastes and gums, sodium pentachlorophenate, sodium trichlorophenate, sodium dinitrocresolate and sodium-*p*-chloro-*m*-xylenate give good results. Uses for quats, mercurials and hydantoins were described. A list of references is available from the convener.

Inhibition of viruses

At a Royal Society Conversazione workers from the National Institute for Medical Research demonstrated the production and action of their latest antiviral discovery. Interferon is a protein which inhibits the growth of a number of viruses without apparently causing any gross damage to the host cells. It can be easily produced in the laboratory. Chick chorio-allantoic membranes are incubated with ultra-violet inactivated virus at 37°, and after 3 hr. the virus is removed and the membranes incubated overnight in a buffered salt solution. Interferon is formed in the membranes and released into the fluid, and its activity is measured by the ability to inhibit the growth of influenza and related viruses in pieces of chick tissue in test tubes. Concentration of Interferon X10 affects growth of vaccinia and cowpox viruses in fertile hen eggs and prevents formation of specific virus nodules in rabbit skin. For academic studies Interferon will be of value in studying virus growth multiplication: its practical value lies in ease of production, activity against a wide range of viruses *in vivo* and *in vitro*, and its non-toxicity. Further research will reveal whether it has any practical value in human medicine.[5]

Effect of plastics on microbes

Plastics are widely used for many different purposes, but their effect on the development of bacteria has not been extensively studied. Work has now been done to determine if some plastics may be inhibitory to bacteria commonly found in milk.[6] This investigation arose from the development of an inexpensive, single service plastic bag and catheter for collecting milk samples directly from udders and dispatching to a laboratory for bacteriological testing. Twenty-three plastics in pellet or powder form were tested, using *Esch. coli* and *Staph. aureus* in the first instance. As a preliminary, various plastics were incorporated into agar medium and autoclaved, and then sown with the test micro-organisms. No growth inhibition was observed. Next, milk samples infected with staphylococci and streptococci and various plastics were added to the milk. Again there was no growth inhibition. The authors concluded that plastics of types including polyethylene, polyvinyl chloride,

acrylic plastic, nylon resin, tri and tetra fluoro-ethylene resin, polystyrene, ethylcellulose, and cellulose acetate butyrate were not toxic to the organisms investigated: and that these results indicate the feasibility of fabricating a satisfactory single service plastic bag for transporting aseptically collected milk samples to the laboratory.

Surfactant-iodine complexes as germicides

Considerable attention has been focused on the detergent-steriliser efficiencies of various non-ionic-iodine complexes. In a recent paper from the U.S.[7] tests made on such compounds are described, particular attention being paid to nonyl phenyl ether of polyethylene glycol and polyethoxy polypropoxy polyethoxy glycol. From the chemical tests made it is considered that in the preparation of such non-ionic surfactant iodine complexes, loss of titratable iodine is due to the action of the surfactant and the acid formation. The remaining iodine appears to have increased stability in dilute aqueous solutions, no staining characteristics, and reduced skin irritation.

Microbiological tests were made using a surfactant iodine complex consisting of: phosphoric acid 15·95%, nonyl phenyl ether of polyethylene glycol iodine complex 12·6%, poly-ethoxy poly-propoxy polyethoxy glycol iodine complex 4·85% (giving 1·75% available iodine) and water 66·6%. Tests with this material were done at 50 p.p.m. using the Cantor-Shelanski Capacity Test with common Gram-positive and Gram-negative organisms and fungi. Hypochlorite and a quat were tested as controls each at 200 p.p.m. The test temperature was 15° and total solids were added as whole milk and broth. Sporicidal tests were done by Ortenzio's method against three organisms. From these tests the authors conclude that their product is "quite superior" to both sodium hypochlorite and a quat (unspecified) against all organisms tested. Tests against various viruses were conducted and the results obtained eulogistically interpreted.

Observers on this side of the Atlantic always make allowances for the enthusiasm of their American cousins, but from our stand-point the day is long past when any "new" detergent steriliser material can be written up in one short paper with insufficient laboratory data and unsupported by field trial results.

Bactericides for sheep pelt soaking pits

When received at the factory salted sheep pelts are soaked in pits up to three days to remove the salt and free them of soil prior to wool removal. Several types of spoilage thought to be due to bacteria may arise during washing and soaking the pelts. Halophilic bacteria cause "heats" in pelts which form red, brown and purple discoloration, and some workers believe the thin translucent areas in pickled pelts are also due to bacteria multiplying during the washing and soaking process.

Bacterial counts from wash water range from 10^8 to 10^{11} per 1 ml., and putrefactive and protein liquefying bacteria form part of these populations. These problems are being met by attempting to discover better methods of bacterial control during the washing and soaking process. A laboratory screening test of such bactericides has now been described.[8] Test pieces of natural salted pelt between 20 g. and 50 g. were used. These were soaked for three days in various solutions under conditions simulating plant practice.

Thirty - four chemicals were screened alone and three combinations of two were tried. Each treatment was evaluated for odour and bacterial count. Factors such as concentration of the material used, cost, and effect on the pelt and wool were carefully considered, and on the results obtained it was decided to test two chemicals, sodium silicofluoride and *Duomac C* in the plant. These products reduced bacterial counts to less than 99·9% of the control untreated soak pits. The pelts soaked in *Duomac C* were more pliable and gave cleaner wool than the control; while those soaked in silicofluoride showed a slight reduction in pelt pliability only.

This paper is a model report of an essay in applied bacteriology and is worth studying for that alone. The comparative efficiencies of the disinfectants employed under such test conditions makes very interesting reading.

Boric acid-water-sorbitol solutions

Saturated solutions of boric acid (5%) are commonly used as a mild antiseptic. It had been reported that sorbitol will increase the solubility of boric acid up to 20% by weight. Work has now been undertaken to see if increased concentrations of boric acid would give higher antibacterial function.[9] *Staph. aureus* (F.D.A. 209) was the test organism grown in nutrient agar at *p*H 6·8 or nutrient broth at *p*H 6·9. The penicillinder method was used, and when zones of inhibition of growth were obtained after incubation at 37°C. areas of the inhibitory zones were subcultured into broth. Controls were solutions of sorbitol from 0 to 70% by weight in increments of 5%, and the test solutions consisted of a range from 5·57% w/w boric acid (*p*H 3·8) to 18·66% w/w boric acid with 56·96% sorbitol (*p*H 1·6), and also aqueous solutions of boric 0-5% with a *p*H range of 7·2-3·95. Results showed all sorbitol solutions grew staphylococci. Test solutions results suggested that the maximum antibacterial activity of boric acid occurs at about 5%. Any further increase in boric acid concentration made possible by the addition of sorbitol was not indicative of greater antibacterial activity as shown by the tests used.

There is a refreshing air of enthusiasm and dogmatism about this paper. For instance, "the wider the zone the greater are the diffusion and antibacterial powers of the substances." If only it were always true!

Bacteriostat losses from injections

It has long been known that injection solutions preserved by the addition of phenolic bacteriostats may, if kept in rubber closed containers, gradually lose the bacteriostat on storage. In 1923 such injection solutions stored for 18 months showed the loss of 50-70% of cresol and 20-40% of phenol from rubber capped vials, and since then other reports of a similar nature have come to hand. The authors of a new paper on this subject[10] give a first-hand report of insulin vials being examined after having been for 12-18 months in the tropics, and showing 60-70% loss of cresol which had been originally added as a preservative. They go on to describe their experiments to ascertain the amounts of phenol, cresol and chlorcresol absorbed from hot and cold solutions in various times by red and white rubber. These tests were taken further, using

hot treatments on successive days to ascertain the cumulative uptake of phenols by rubber. Tests were made on the partitioning of bacteriostats between rubber and water, using solutions of benzyl alcohol, phenol, cresol, chlorcresol, chlorbutol and phenylmercuric nitrate, and from the results obtained data were derived which led to equilibrating rubbers with the various bacteriostats. Losses of cresol from different kinds of rubber closed containers such as cartridges and vials were estimated. It was again shown that bacteriostats are not only absorbed by rubber, but they diffuse through under some conditions and are ultimately lost by volatilisation. The effect of paraffin wax seal in preventing loss of bacteriostats and also viscose, paint, sputtered metal and various metal overseals and resin-coated foils were tried. The wax gave the best result but sometimes blocked the injection needle lumen. The authors conclude that no complete solution to the problem is yet in sight, and indicate that probably the best bacteriostats are still phenol and benzyl alcohol and that any phenylmercuric salt is poor.

This is a useful paper, but any bacteriologist with long experience of the abuse which can be meted out to rubber capped vials into which a needle is plunged will hope that their use will give way to sealed ampoules.

Fungal growth in tolu syrup

Syrup of tolu B.P. has a high sucrose content plus benzoic acid, yet a report comes of an 80 oz. bottle of this product containing a submerged fungal growth and having a toluene-like smell.[11] The smell appeared to come from benzoic or cinnamic acids or their esters. Since these were the sole carbon sources the question arose as to whether these acids could support fungal growth under certain conditions. A series of graded solutions of the acids in Czapek-Dox medium at *p*H 5 were prepared. The inoculum was air-dry fungal spores. Inoculated media was incubated for seven days at 24°C., after which tubes were examined for growth and odour. In the absence of sugar in the medium growth was supported by sub-inhibitory concentrations of both acids, but the toluene odour was detected only when cinnamic acid was used. It appeared that the presence of sucrose or glucose at the strengths used raises the tolerance of penicillinium to cinnamic acid, but has a doubtful influence on resistance to benzoic acid. Further experiments suggested that the conditions required for penicillium growth in syrup of solu were that:

The *p*H should be above 4·4·2, indicating the deficiency in aromatic acids and the initial inoculum fairly heavy. Variation in sucrose concentration between 55% and 67% w/w had no effect in permitting growth. The author points out that other workers have found that inhibition of fungi, yeasts and bacteria by benzoic acid and certain derivatives is largely dependent on the concentration of undissociated acid, the benzoate ion having a much lower inhibitory activity.

REFERENCES

1. L. J. Hanka and W. R. Lockhart, *J. Bact.*, **75**, 1958, (4), 471.
2. R. W. Vander Wyk and A. E. Granston, *J. Am. Pharm. Ass.*, 1958, **47**, (3), 193.
3. F. R. C. Bateson, J. A. Box and C. Gunn, *Pharm J.*, 1958, (4931), 334.
4. T. C. Grubb, *Bact. Rev.*, 1957, **II**, (4), 251.
5. *Pharm J.*, 1958, (4934), 391.
6. B. H. Johnson and S. C. Braunstein, *App. Microbiol*, 1958, **6**, (2), 121.
7. P. G. Bartlett and W. Schmidt, *App. Microbiol.*, 1958, **5**, (6), 355.
8. J. H. Richardson, *App. Microbiol.*, 1958, **6**, (2), 142.
9. J. J. Sciarra, D. E. Shay and J. Autian, *J. Am. Pharm. Ass.*, 1958, **47**, (3), 180.
10. A. Royce and G. Sykes, *J. Pharm. and Pharmacol.*, 1957, **9**, (12), 814.
11. B. A. Wills, *ibid.*, 1958, **10**, (5), 302.

Pest Control Chemicals

By D. P. Hopkins, B.SC., F.R.I.C.

Rothamsted research ● Orchard fungicides ● Bordeaux mixture preparation ● Urea-formaldehyde soil disinfectants ● New acaricide Mite ovicides ● Seed potato disinfectants ● Eelworm killers ● Attractants for fruit flies

Pure pyrethrins

A NEW method for preparing pure pyrethrins I and II from pyrethrum extract has been devised at Rothamsted Experimental Station. It is based upon the regeneration of pyrethrolone and cinerolone semicarbozones with dilute sulphuric acid in 24 hr. rather than by 6-18 weeks' treatment with $KHSO_4$ solution. The pyrethrolone keto-alcohol can be purified by low-temperature crystallisation from ether; esterified with naturally-derived chrysanthemic and pyrethric acids, it can be the basis for making sufficient amounts of pyrethrins I or II for large-scale experimental work.[1] This advance may open up much new fundamental knowledge of the pyrethrins.

Wheat-bulb fly control

Much work has been done to find better chemical controls for wheat-bulb fly.[2] Fifteen substances were field-tested as seed dressings and compared with dieldrin and heptachlor; none was better, but chlordane was found to be comparable. Dieldrin is considered high in cost though probably the most effective treatment; a new finding is that a 4% dieldrin dust applied in December may give equal or better control than seed-bed applications later, but as this does not involve use of lesser amounts it would not seem to reduce cost.

Bean aphid

Bean aphid control has also been investigated.[3] Early June spraying with systemic insecticides (*e.g.*, demeton-methyl) avoids upsetting later natural control by predators of the bean aphis. Control seems more decisively secured by systemic treatments, which are effective in either high- or low-volume; with contact insecticides, high-volume spraying gives better results but the control at best is poorer.

An interesting development is the confirmation of dieldrin's systemic effect when used as a seed

New Pyrethrum Extraction Plant in Kenya

Kenya pyrethrum growers and members of the Pyrethrum Board inspecting a new extraction plant at Nakuru, Kenya. Cost of the plant, which will come into operation soon, will be in the region of £200,000. *The progress made by the pyrethrum industry in Kenya in the past two years was described as spectacular by the Governor of the Colony, Sir Evelyn Baring,* G.C.M.G., K.C.V.O., *speaking at a luncheon given at Nakuru by the Pyrethrum Board of Kenya during the Annual Delegate Conference of Pyrethrum growers. He pointed out that the Pyrethrum Board, which markets the flower for the growers, paid out to growers in* 1948 *a total of* £165,000, *but in* 1958 *it paid out* £1,226,000 *more. In the same period the Board's capital assets rose from* £71,000 *to* £208,000. *The Governor also referred to the increased growing of pyrethrum by Africans and thanked the Board for its co-operation in this work.*

dressing[4] for wheat. Under certain soil-positional conditions for seed and pest larvæ, the systemic action may be wholly responsible for control.

Slug-killer research

A forthcoming study of garden slug populations is mentioned;[5] slugs labelled with radio-iodine will be used. It is the absence of a method of estimating slug populations that has long handicapped slugicide testing. In this connection some other comments may be referred to.[6]

Orchard fungicides

Continued success with phenyl mercury fungicides as the control for apple scab is reported;[7] in the test area—Wisbech—scab is much less incident though the number of sprayings has been reduced by about half. Evidence that this is due to the change to phenyl mercurial sprays is circumstantial but nevertheless strong.

At Long Ashton Research Station captan has successfully controlled apple scab,[8] but, compared with lime-sulphur, the incidence of mildew increased, suggesting that the choice of captan for apple scab depends upon estimating the balance of scab and mildew risks. Potential orchard fungicides have been given preliminary tests.[9] These were Griseofulvin, Nystatin and Actiriin (all antibiotics); *o*-hydroxydiphenyl, bis-(3-chloro-6-hydroxyphenyl) methane, bis - (3 - chloro-6 - hydroxyphenyl) - 2 : 2 : 2 - trichloroethylidene, and bis-(3-chloro-6-hydroxyphenyl) sulphide; decamethylene - bis - 4 - aminoquinaldinium chloride, hexadecamethylene-bis-isoquinolinium chloride, and 2 : 4-dichloro - 6 - (*o* - chloroanilino) - *s*-triazine; and *n*-dodecyl-guanidine acetate. These preliminary tests for fungistatic activity against apple scab and *S. laxa* suggest that three of the 11 warrant larger-scale testing, the first and the last two in the list as named above. There is already some evidence of phytotoxic risks with *o*-hydroxy-diphenyl, however.

Preparation of Bordeaux mixture

In this report a year ago (see MANUFACTURING CHEMIST, 1958, **29**, 32) Long Ashton work on the efficiency of preparations of Burgundy and Bordeaux mixtures was briefly mentioned. Now a fuller report on preparing the latter has been given.[10] Seven procedures were compared, two being found the most efficient—adding concentrated lime suspension to dilute $CuSO_4$ solution, or simultaneously pouring weaker lime suspension and dilute $CuSO_4$ solution, 50-50 by volume, into a third vessel. The former method is the more easily practicable, but it represents the reverse of practice often customary. It is clearly shown that the two best methods give more efficient precipitates, judged by sedimentation and crystallisation rates and by spray deposit tenacity and fungi-toxicity. It can be wondered whether this older fungicide has always been prepared efficiently in comparative test work that has helped to develop other fungicides.

Mercury contamination of fruit

Returning to the subject of phenyl-mercurials as fruit sprays, residual deposits on apples have been studied after applications of phenylmercuric nitrate;[11] residues of Hg were found in the fruit after store, with an average contamination of 0·05 p.p.m. and distributed in a 4 : 1 ratio in flesh and peel. Mercury was still present in peel and flesh after baking. Whether this is to be regarded seriously is not stated; it has yet to be determined what the toxicological significance of these levels of contamination may be.

Urea-formaldehyde for soil disinfection

Perhaps one of the most interesting papers from the U.S.A. for some time is an account of the use of a urea-formaldehyde condensation product for soil disinfection, tested in this work against potato scab.[12] U-f condensation products are already well known as slow-acting nitrogenous fertilisers. In u-f fertilisers, the formaldehyde controls the speed of action of the urea's nitrogen. In soil disinfection, the urea controls the formaldehyde's volatility. Too much must not be made of this inversion of rôles, for whereas u-f fertilisers have a high u-f ratio, a low u-f ratio characterises this, or any other potential, u-f soil disinfectant. In the U.S. research reported, the product has a urea-to-formaldehyde mole ratio of 0·217, being composed of approximately

26% urea and 60% formaldehyde; the extent of condensation is not high, for it is a liquid, viscous and water-miscible. For potato scab control testing it was applied on the same day as seed-planting, sprinkled on to the soil in a 3 : 1 dilution with water. In two successive years of testing, scab incidence with a scab-susceptible variety was reduced by 95% and 93%, which was superior control to that given by pentachloronitrobenzene, one of the recognised anti-scab applicants. However, there seems to be a phytotoxic limit to the rate of u-f use, not more than about 150 gal. per acre being safe with certainty. Fifty gallons may be an adequate rate to control scab. Whereas in u-f fertilisers the formaldehyde content has no value except that already exerted in the manufacturing process, the urea in this type of u-f soil disinfectant retains its nitrogenous fertiliser value. A 50 gal. rate of use involves the addition of about 125 lb. of urea per acre, equivalent, say, to at least 2½ cwt. of sulphate of ammonia, which is about half the maximum nitrogen requirement of a high-yield potato crop. This development is not quite as new as these comments might suggest; the u-f liquid product was first used as a celery seed-bed steriliser in 1956,[13] but the report of this work was not seen at the time.

A new acaricide

OO-diethyl S-2-diethylaminoethyl phosphorothiolate or *Amiton* has been comprehensively reviewed in a British paper.[14] In the form of the oxalate salt at a rate as low as 10 p.p.m. it gave complete control of red spider mite under British conditions. In U.S. trials with cotton it achieved full eradication of all mites within 24 hr. and there was no re-infestation within six weeks. Its insecticidal activity being much lower than its miticidal activity, the accompanying effect upon predatory and beneficial insects is not severe. It is highly mammalian-toxic, but no more dangerous in this respect than other organo-P pesticides. In handling, the usual precautions for these chemicals must be strictly observed. The risk in use is reduced inasmuch as one spraying per season, or perhaps even one in two seasons, is all that is needed for red spider mite control. Residues on crop products would seem very minute, but work on this aspect is still in progress.

Mite ovicides

Mite ovicidal activities of some chloro - substituted bisphenoxymethanes and related compounds have been discussed.[15] New methods for preparing this series of compounds made it possible to test a long series. Mite ovicidal activity was high when one phenyl group remained unsubstituted and this increased with an increasing number of chlorine atoms in the other phenyl group, the exact position of the Cl atoms in the ring being important. However, the practical significance of this research faded with the recognition of poor persistence in field use; even the best compound seems unlikely to give adequately prolonged control of an actual field infestation. The work has in fact emphasised that persistence is a major property of acaricides; whatever the laboratory-tested activity of a substance may be, unless there is sufficient residual control to deal with three generations of spider effectively, infestation is likely to re-establish itself.

The somewhat negative findings reported in this paper can be compared with the more positive claims of the paper just discussed above.

Seed potato disinfectants

According to an American paper,[16] streptomycin sulphate improved the performances of most seed fungicides in controlling bacterial ring rot. Alone, however, it did not give adequate control. The combined treatment was much more promising and may become the recommended one. In other treatments the additive effect of streptomycin sulphate was not as powerful and in some cases not even measurable when the other substance was also an antibiotic.

In Scotland[17] dipping seed potatoes in an organo-mercury suspension has been tested as a commercial control over tuber diseases such as dry rot and skin spot. Substantial control over both these diseases was obtained. However, as the time advanced after treatment, the advantages of disease control, first easily discerned, tended to recede—longer sprout length was much more marked in early weeks of storage, and earlier emergence after planting was a growth advantage that disappeared within five or six weeks. It would seem that the untreated controls could "catch up" on the treated and disinfected seed potatoes by the time the grown crop matured. The Scottish report is incomplete, for yield checks have not yet been fully given; early plot measurements showed only small yield gains for the treatment. It would seem that under the conditions of this particular research the effects of the diseases are not serious enough to justify control measures. Such a basic situation, even if general, could change with some alteration in the intensity or proportion of infections.

Eelworm control

In another Scottish paper[18] methods for controlling eelworm diseases are reviewed. DD and EDB are mentioned, of course, but the residual unkilled proportions of eelworms remain a serious problem, sufficient to cast doubt on the economic merits of DD (or EDB) injection. EDB is now considered less useful than DD; despite its helpful falls in price it remains no cheaper than DD and its freeze-up tendency in cool weather causes injector-operation troubles.

1,2-Dibromo-3-chloropropane or Nemagon (developed in U.S.A. by Shell Chemical Co.) has been tested, but although effective at much smaller rates per acre than DD its need for a fairly high soil temperature has militated against successful use in outdoor Scottish trials. Very little control of potato eelworm was secured. It gave much better control in glasshouse experiments during a severe infestation of eelworms in cucumber cropping, but the effective rate also caused severe damage to the plants.

Chloropicrin has given promising field results, but its cost makes it uneconomic for medium - value potato growing.

Finely - divided mercury compounds have been used experimentally. The material must be fine and the mixing-in with the soil must be intimate, so mechanical mixing was developed. Only about 5½ lb. of mercury material per acre brought substantial reductions in eelworm population, accompanied by large increases in crop yield. These results are promising, but the economics of the treatment have yet to be assessed. It is said that several Hg compounds were effective, but grey powder (finely divided elemental Hg) was the only one specified by name.

Although this paper comments encouragingly on the great progress made in 10 years towards chemical control of eelworm diseases, it includes the statement that the appearance of a commercial potato variety resistant to eelworm is "only a matter of time." So it seems that the prospects for eelworm killers are poor.

Fruit fly attractants

A year ago (see MANUFACTURING CHEMIST, 1958, **29**, 33) the development of synthetic attractants for the Mediterranean fruit fly was mentioned. A paper summarising this U.S.D.A., Beltsville, work has now appeared.[19] The screening of the promising esters of 6-methyl-3-cyclohexene-1-carboxylic acid initially led to the conclusion that the isopropyl ester was the best; several thousands of pounds were made and used in the Florida programme for Medfly control. Later the *sec*-butyl ester was found to be about twice as attractive as the isopropyl ester under conditions when evaporation was not controlled. An interesting aspect of the paper is the relationship between molecular structure in the esters and attractant properties, but field performance is also much affected by the volatility factor. The toxicant used in conjunction with the attractant esters was DDVP or 2,2-dichlorovinyl dimethyl phosphate. None of the synthetic esters is quite as good an attractant as angelica seed oil, but, as stated before, the supply of this natural material was quite inadequate to deal with the Florida infestation—by 1956 accumulated world stocks had been used and the price had risen from 56 to 220 dollars per lb.!

Attractants are used either for surveying insect populations or as baits for toxic materials.

Wetting agents

Besides the article recently published in these pages (J. S. Stanley, MANUFACTURING CHEMIST, Aug. and Sept., 1958, pp. 334 and 385) a study of wetting agent efficiencies, carried out at the Plant Pathology Laboratory, has recently been reported.[20] Attempts to correlate wetting of leaves and waxed discs did not achieve good results. The wetting efficiency of a spray is influenced by the pesticide's influence and by the nature of the leaf surface being sprayed. Non-ionic wetting agents did not lose their wetting efficiency through the presence of pesticide so they seem to have this advantage over ionic agents.

Arsenicals questioned

A short but significant contribution has attacked the rising modern use of sodium or potassium arsenites for potato haulm defoliation.[21] This development has expanded because of the temporary sulphur and sulphuric shortage of 1951 and because arsenites are less machine-corrosive, slightly cheaper, and easier to apply. The author emphasises the animal health risk, and possible human health risk also, that is associated with arsenical defoliants. The number of cases of farm animals poisoned by arsenic per year has risen by 142% since the introduction of these defoliants in 1952. The use of arsenical sheep dips has largely been discarded in favour of the far safer BHC dips, but the reverse of this move towards lesser toxicity is occurring in the potato fields. A case is cited of more than 20 cows dying through gaining entry to an arsenite-sprayed potato field; another case involved the loss of a third of a farmer's milking herd where the pasture field was bounded on two sides by another farm's potato land—the cause in this instance being either spray-drift or arsenical deposition on the hedgerow. It seems remarkable that a veterinary scientist has to draw attention to this problem of obvious hazards.

REFERENCES

1. M. Elliott, *Rothamsted Annl. Rept.*, 1957, 1958, 136.
2. R. Bardner, *ibid.*, 1958, 144.
3. M. J. Way and C. J. Banks, *ibid.*, 1958, 148.
4. M. J. Way, *ibid.*, 1958, 149.
5. J. A. Cochrane and H. F. Barnes, *ibid.*, 1958, 155.
6. *Chemistry and Industry*, 1958, **23**, 665.
7. J. M. Hirst and O. J. Stedman, *Rothamsted Annl. Rept.*, 1957, 1958, 117.
8. R. J. W. Byrde, G. M. Clarke and C. W. Harper, *Long Ashton Annl. Rept.*, 1957, 1958, 93.
9. R. J. W. Byrde and N. M. Waugh, *ibid.*, 1958, 89.
10. E. Somers, *ibid.*, 1958, 82.
11. J. T. Martin and J. A. Pickard, *ibid.*, 1958, 76.
12. J. F. Bartz and K. C. Berger, *J. Agric. and Food Chem.*, 1958, **6**, 675.
13. J. F. Darby, *Florida Univ. Agric. Exp. Station Res. Rept.*, 1956 (July).
14. G. L. Baldit, *J. Science Food and Agric.*, 1958, **9**, 516.
15. M. B. Green and W. L. Jenkins, *ibid.*, 1958, **9**, 536.
16. R. Bonde and B. Johnson, *Plant Disease Reporter*, 1958, **42**, 781.
17. *Edinburgh and E. of Scotland Coll. Agric. Annl. Rept.*, 1957, 1958, 46.
18. J. Grainger, *Scottish Agric.*, 1958, **38**, 93.
19. S. I. Gertler *et al.*, *J. Agric. and Food Chem.*, 1958, **6**, 592.
20. C. C. Thompson, *J. Science Food and Agric.*, 1958, **9**, 650.
21. W. H. Parker, *Agric. Review*, 1958, **4**, 3, 21.

Industry's Publications

Protective clothing. *Nylon's Overall Advantages*, a booklet published by British Nylon Spinners Ltd. quotes examples of the successful use of nylon overalls in various industries and gives data designed to help intending purchasers.

Grangemouth Petrochemicals. "British Hydrocarbon Chemicals Limited 1958" is the title of a new booklet which describes the production and applications of the petroleum chemicals made at Grangemouth, Stirlingshire, by the company and by its two subsidiaries, Forth Chemicals Ltd. and Grange Chemicals Ltd. The description of petroleum chemical developments at Grangemouth since the company was formed in 1947 is brought up-to-date by reference to the new polyethylene and phenol plants, which will be commissioned this year and to the third olefins unit which on its completion in 1960 will be the largest outside the U.S.A.

Safety Booklet. Safe handling practices for phosphorus pentasulphide, a highly reactive intermediate used in making insecticides and organophosphorus compounds, are described in a new safety data sheet issued by the Manufacturing Chemists' Association of America.

Since phosphorus pentasulphide reacts rapidly with water or with the moisture in the atmosphere to release hydrogen sulphide, the manual details safe handling practices for chemical workers. Copies of "SD-71, Phosphorus Pentasulphide" are available for 30 cents a copy from the Manufacturing Chemists' Association, 1625 Eye Street, N.W., Washington 6, D.C.

BP Kent Refinery. To mark the completion of the latest expansion project at their Kent refinery on the Isle of Grain, British Petroleum Ltd. have issued a booklet which, in words and photographs, traces the construction work from the earliest days to the present. The newly completed project has increased the refinery's processing capacity from 4½ million tons to more than 7 million tons of crude oil a year and has added many new refining units, together with enlarged port facilities on the river Medway.

New Facilities for Making Ointments and Powders

THE transfer of Evans Pharmaceutical Laboratories from the premises in Fleet Street, Liverpool, that they have occupied since 1846 to Evans Medical's new factory at Speke has been taken a stage further by the opening of a new ointment department and a powder section capable of handling orders ranging in amount of material from an ounce to several tons.

All service lines for these two working areas are situated in a basement and connections to the machinery and plant are made straight through the floor.

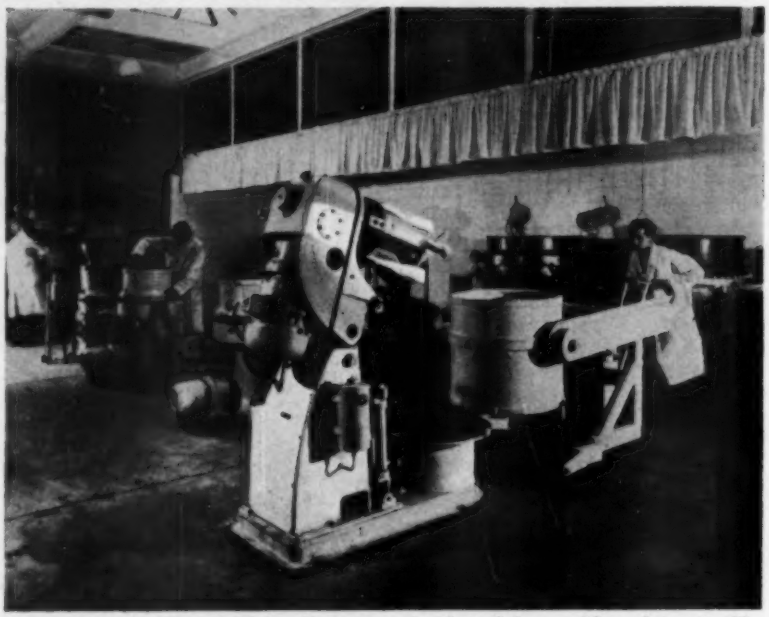
The ointment bases are melted in steam-jacketed pans standing in a line on one side of the department. Above the pans is a canopy provided with exhaust fans to remove vapour: the lower part of the front of the canopy consists of a polythene curtain which permits a tall mobile crane to be moved over the pans when it is desired to empty the contents of drums of material, such as paraffins, into them. Steam or cooling water can be passed through the jackets of the pans and the inlet cocks for steam and water are so linked that only one service can be open to a pan at any one time.

The various ointments, creams and pastes are mixed in change-pan mixers, *i.e.* the Stokes' *Pony* mixer, Cruickshank *Consul* mixer and Innes *Rotamixer*. To improve the appearance of ointments, they may be milled in Wilkinson ointment mills and *Premier* paste mills.

In the powder section powdered materials are mixed to form compound powders. Special arrangements are made to remove dust which collects in the atmosphere.

The smaller batch mixings are carried out in *Colonio* tumbler mixers. For large batches, of the order of 150 to 250 kg., there is a Morton-Lodige mixer, This machine consists of a drum inside which scoops revolve on a horizontal axis; it weighs 2¼ tons when charged.

There is a high-speed swing-hammer mill, the *Mikro-pulveriser*. This machine, when running at full speed and particularly if empty, gives out a piercing noise and to counter this it is fixed on anti-vibration mountings and the walls of its cubicle are lined with a sound-absorbing material.



A corner of the ointment mixing department showing mixing machine, ointment mills and steam pans. The canopy above the pans to the right is fitted with exhaust fans to remove vapour.

A large powder mixing machine in the powder section. This weighs 2¼ tons when charged.

BOOK REVIEWS

Biochemistry of Some Peptide and Steroid Antibiotics

By E. P. Abraham. Wiley (Chapman and Hall). Pp. 96 inc. index. 24s. net.

THE antibiotics discussed in this book are the bacitracin and cephalosporin families which together formed the subject of the 1957 Ciba lectures on microbial biochemistry given by Dr. Abraham at Rutgers University. A good deal of information has been accumulated on the bacitracins, but the cephalosporins have not been produced in sufficient quantity for their therapeutic value to be properly assessed.

Dr. Abraham devotes a chapter to each of these two families, discussing their production, separation and structures. In his third and final chapter he deals with their relationship to other antibiotics.

Physical Chemistry of Electrolytic Solutions

By H. S. Harned and B. B. Owen. 3rd ed. ACS Monograph No. 137. Reinhold. Pp. 803. £8 net.

DISSOLVING an electrolyte in water is a simple procedure. Resultant formation of ions, their solvation, forces acting between them, and their effects on the physical properties of the solution are extremely complex. Development of the theory of such processes has been slow and laborious.

A comprehensive review of published literature on the subject has been issued in book form. It is clearly intended for the expert. Although the title would be held to include non-aqueous solvents, very little space is given to them. Chapters deal with reversible and irreversible processes, numerical compilation of physical constants, thermodynamics of galvanic cells, experimental investigation of strong electrolytes, and polyvalent electrolytes. A whole chapter is taken up with discussion of solutions of hydrochloric acid and another with mixtures of strong electrolytes. The index to the book is not satisfactory.

In the third edition several new sections make their appearance. Thermodynamic treatment has been extended; conductance theory with inhomogeneous terms, conductance equations dealing with any number of ions, general theory of the Wien effect, and diffusion of ions, have all been treated thoroughly.

S. F. BENNETT.

The Economic Development of Detergents

By W. J. Corlett. Duckworth, London. Pp. 208. 25s. net.

THIS book is one of a series of studies being prepared by the Department of Political Economy of University College, London. It is a history of the technical and commercial development of the soap and synthetic detergent industries in this country with, inevitably, a glance at parallel developments elsewhere.

At the outset one must compliment Mr. Corlett on the technical accuracy of his book. There are a few minor technical mistakes, but in general the facts are correctly stated and the correct conclusions are drawn from them. Perhaps the only point worth mentioning here is the doubtful value of attempting to explain the *p*H notation to non-technical readers. It is not made clear, for example, that the *p*H scale is logarithmic, not linear, and that, therefore, a *p*H of 11 represents a degree of alkalinity not 10% greater than a *p*H of 10, but 1,000% greater.

This field is a particularly difficult one to study because of the lack of statistical information available and the general secrecy in the industry. For this reason Mr. Corlett's economic treatment is not as thorough as his technical and commercial treatment.

The importance of marketing techniques in this industry is underlined. It cannot be emphasised too much that innovations are brought about not so much by the technical superiority of oligopolistic organisations, but by their ability to exploit innovations through their superior marketing organisations.

In general this book can be commended to the technical reader who usually needs to be reminded that the practice of chemistry is not an end in itself but a way of making money.

KENNETH TOMLINSON.

Bookshop Service

All books reviewed in MANUFACTURING CHEMIST and all other scientific or technical books may be obtained from:

Technical Books,
308 Euston Road,
London, N.W.1.
Telephone: Euston 5911.

Prompt attention is given to all orders.

Pressurised Packaging (Aerosols)

By A. Herzka and J. Pickthall. Butterworths Scientific Publications, London, 1958. Pp. 411. Illustrated. 63s. net.

ALTHOUGH numerous articles on aerosols and "pressurised packs" have appeared, this is the first textbook to be published on the subject. Written by two authors, both of whom have extensive experience in this field, one expects a valuable contribution, and this expectation is realised.

Having discussed the history of aerosols, and the general principles of the construction and operation of modern types, succeeding chapters are devoted to propellants, dispenser components, filling techniques and laboratory evaluation. The remaining chapters, comprising approximately half the book, deal with the formulation of a wide range of products and provide numerous specimen formulations.

So many technical problems arise with aerosols that it is particularly helpful to be provided with so much useful information, drawn from the authors' own wide experience, on such matters as corrosion of containers and product deterioration. Much information is provided about the physical properties of propellants and solvents.

One of the authors is known to have strong (and, in my opinion, correct) views about the danger of uncoated glass aerosol con-

tainers. The section dealing with this includes some impressive photographs. The book is well illustrated throughout.

The chapter on laboratory evaluation will be particularly useful to newcomers to the subject in providing them with methods of testing, and criteria for satisfactory shelf life and performance of commercial aerosols. However, the descriptions of the construction of one or two of the special pieces of equipment could, with advantage, be made clearer.

In a book by two authors, which, having dealt with general considerations, proceeds to cover detailed applications product by product, some repetition is inevitable. This happens in the present book. However, the writing is good, despite occasional eccentricities in in punctuation, and is most readable.

Misprints noted are few, *e.g.* on p. 79 a reference should be to figure 53F and not 80F; the structural formula given in the table (p. 246) for the chrysanthemic acid moiety of allethrin is incorrect (as will readily be seen by comparison with the immediately succeeding, and correct, type formula for the pyrethrins). It is surprising that, of the three pyrethrum synergists tabulated on p. 247, only one is in extensive use (or even readily obtainable) in the U.K., while the other (*Bucarpolate*) that is widely used here is not mentioned. The expression (p. 19) " . . . the liquefied gas propellants which are likely to interest readers of this book *in order of decreasing vapour pressure*, . . . " (my italics) is quaint and somewhat ambiguous.

However, these are minor criticisms that detract little from the undoubted value of this book. The authors are to be congratulated on providing a volume that will be read, and frequently consulted, by those interested in the preparation and use of commercial aerosols.

WILLIAM MITCHELL.

Tabellenbuch Chemie

Published by F. Vieweg and Sohn, Braunschweig. Pp. x+438. *DM* 17.60 *net.*

THE German passion for system and order is exemplified by this book which provides over 50 sets of tables ranging from the periodic table to tables of viscosity and the characteristics of filter papers. Among the more important tables are those giving the nomenclature of inorganic and organic structures, the solubility of gases and solids, dissociation constants of electrolytes, quantitative analytical data, *p*H values and indicators, and corrosion resistance.

The tables are clearly set out and easy to find. Most English-speaking chemists ought to have enough German to understand them.

Reports on the Progress of Applied Chemistry

Vol. 42, 1957. *Published by the Society of Chemical Industry. Pp.* 910. £5 *net.*

IT is difficult to review a review and more difficult to review a collection of reviews. The design and purpose of " Reports on Applied Chemistry " are too well known to need much introduction. In this volume are over 50 reviews of the literature on as many different aspects of chemical industry. Each is prepared by an expert in the particular subject and each is based on a devoted search of the literature. This compilation, literally the essence of thousands of papers, is carefully indexed by subject and by author so that the reader has easy access to a great deal of information.

These reports have been prepared in the same way for many years and it may be asked whether it is not time for a change. Forty years ago a chemist might have been interested in fuel, agriculture, medicine and chemical engineering all at the same time. But how many modern chemists can possibly make use of information in all these diverse fields? The main section headings illustrate the point: Fuels; Inorganic Chemistry; Metals; Organic Chemistry; Biological Products; Textiles, Plastics, Adhesives and Paints; Chemical Engineering; Agriculture and Food. Would it not be better to issue these sections as separate volumes at, say, 20s. each instead of asking the reader to pay £5 for a book of which perhaps only one-quarter is of real use to him? They need not even be stiffly bound, which would further reduce costs and accelerate publication. The present book, like its predecessors, appeared a year or more after the date of its subject matter, a delay which is inevitable with the present system.

W.G.N.

Madison Avenue U.S.A.

By Martin Mayer. The Bodley Head, London. 1958. *Pp.* 319. 25*s. net.*

IF advertising means anything in your life, there can be no doubt you will enjoy reading this book, although perhaps " enjoy " is not the right word. It will make you think furiously. In a very practical way, the author sets out to tell you what sort of people work in advertising, and the remarkable Mr. Mayer makes it about as clear as anyone can. The reader begins to think he has penetrated the veil, but let him postulate a single problem of sales forecast cum advertising and, alas, the perplexities multiply.

It is an interesting book. The chapter headings tell what it is all about: " The Advertising Man: Habitat, Functions and History," " And This is How We Know We're Right," " How to Run a Great Big Agency." The book tells how the campaigns are planned, and how they are carried through, with one or two practical and highly entertaining illustrations from very big campaigns indeed. Early in the book the author says that the way the agencies are remunerated is peculiar to advertising, is in fact, " very peculiar indeed." All the publishers we know agree. On p. 29 he refers to the publishers' commission, and throws doubt on its ethics. On p. 32 he says, " there can be no return to personal selling, for capitalism is finally committed to the intensive use of advertising." We read elsewhere that all wars end and will end with the infantryman; perhaps a pertinent point.

He indicates on the next page that one advertiser said that all he wanted was the " proofs," he did not care if the advertisements never appeared. He wanted to show them to the retailers, in the hope, no doubt, that they would be convinced the product was pre-sold.

An advertiser in *Time Magazine* wouldn't accept the offer of an extra page at half price, because " I'm in Florida in January, playing polo. Everybody's in Florida, playing polo in January." This is the personal aspect of advertising which must make agencies despair. A few pages after this quotation appear the words " social insecurity is equally unavoidable "; the agencies are criticised because of

their people's " wild overestimate of the industry's effective power."

There is a great deal more to be said about this book, and hundreds of quotable remarks, with some of which the reviewer does not agree. He is convinced that the sort of advertising discussed in this book is unsuitable to the technological buyer, but he can but recommend the business man to buy and read it, and read between the lines.

W.L.H.

Disinfection and Sterilisation

By G. Sykes. 1958. *E. and F. N. Spon, London.* 1958. *Pp.* 396. *75s. net.*

INDUSTRIAL chemists and microbiologists concerned with the protection of foodstuffs and other organic materials should not be misled by the somewhat absolute title of this book into thinking it has nothing for them. Although primarily concerned with disinfection in its hygienic and medical aspects, the book does in fact deal with inhibiting as well as killing agents, and contains a final chapter on industrial " preservatives."

Part I deals with theory and mode of action of disinfection, and with testing methods. The various factors affecting disinfectant action are clearly explained, and chemical agents are shown to be selective in the enzymes they inactivate. It is emphasised that the rate of disinfection is governed primarily by the variability of resistance in the population under consideration: nevertheless the " monomolecular theory " rears its head rather to excess (pp. 15, 93, 121).

Testing methods, old and new, are reviewed in chapters 3 and 4, and much sound advice is given. The reader is adjured, for example, to consider the purpose of testing before selecting his test, and not to expect too close correlation with behaviour in use. Attention is given to surface disinfection tests, *e.g.* for dairy disinfectants. But one would appreciate guidance on how to evaluate the numerous current claims for " self-sterilising surfaces." Here one requires a method, not for testing disinfection of infected surfaces, but rather for testing infection on disinfectant surfaces—which presents difficulties.

It should be noted that the author interprets " antiseptic " as meaning a disinfectant applied to living animal tissues. In my opinion, the more general British and American usage—when using the term in a specific rather than a vague sense—is to define an antiseptic as any chemical agent *inhibiting* growth of micro-organisms. Much confusion of thought would be avoided if everyone scrapped such terms as " disinfectant " and " antiseptic " and referred to -cidal and -static agents. The difference is often one of degree, but the distinction is most important when selecting test methods. With agricultural " fungicides " and industrial " preservatives " inhibiting power is essential, and killing usually quite unimportant.

Part II contains chapters on the various methods of sterilisation—by heat, radiation, filtration, gases and vapours, cold, desiccation, etc. A fair balance is kept in describing the uses and limitations of ionising radiation and U.V. radiation.

A chapter on air disinfection is followed by one on disinfection of viruses. Many chemical agents are shown to inactivate viruses *in vitro*, though less effective in practical application.

Part V contains five chapters reviewing in a very comprehensive manner the principal classes of disinfectants, notably phenolic substances, dyes, quaternaries, halogens and heavy metals. On p. 255 *Shirlan* is referred to as salicylamide, though elsewhere correctly called salicylanilide.

A final chapter on " Preservation and Preservatives " gives a brief account of industrial uses of -static agents. Several rather dubious statements from the literature are quoted, *e.g.* that hygroscopic materials are more susceptible to mould infection; that cotton will not mildew below 92% R.H.; and that zinc naphthenate is no more active than naphthenic acid. The protection of pharmaceutical preparations is fully treated, as also is that of paints. Although the use of diphenyl and iodine in fruit wrappings is mentioned, one would welcome a fuller treatment of the vapour phase mould inhibitors now finding increasing application.

This book contains over a thousand references, and is well indexed. It should quickly establish itself as an indispensable reference book, both for its wide survey of the literature, and for its masterly summaries on various aspects of its subject.

L. D. GALLOWAY.

Crushing and Grinding

A bibliography compiled by the Dept. of Scientific and Industrial Research. H.M.S.O. Pp. 425 *inc. index.* 35*s. net.*

THE publication in 1951 of a " Bibliography on Industrial Drying " by the D.S.I.R. led to the idea of publishing bibliographies on other unit operations as a small contribution to filling one of the gaps referred to in the Report of the Committee on Chemical Engineering, namely the collection and interpretation of research information. This book is the result. It begins with nine short reviews of crushing and grinding, including one on fundamental aspects and another on grinding in the field of dyestuffs and organic chemicals. Then follows 2,800 abstracts divided into these sections: fundamental aspects, crushing and grinding practice, coarse reduction, fine reduction, non-mechanical methods, materials, methods of particle size and surface area determination, classification and dust and fire hazards.

The book is thorough, comprehensive and unique, having had the benefit of a small planning committee of experts.

Writing an article or a book?

The Editor invites articles on subjects of technical and engineering interest in the field of pharmaceuticals, fine chemicals, cosmetics, toilet preparations, perfumery, soap, detergents, agricultural and pest control chemicals and all other subjects covered by **Manufacturing Chemist**. Articles should be written in the language which working chemists can understand and should be factual and practical. Intending contributors should first send the Editor a synopsis. Articles should be typed in double spacing with wide margins and on one side of the paper only. They should be accompanied by photographs, diagrams, flow-sheets, graphs or drawings. All should bear the name and address of the Author.

The Leonard Hill Technical Group, publishers of **Manufacturing Chemist**, also invite the submission of technical and scientific manuscripts of books for consideration. Leonard Hill are well known for successful promotion of their books by vigorous advertising in their own journals and other media. This is supported by a world-wide selling and distributing organisation. MS, prepared in the same way as articles, should be sent to The Manager, Leonard Hill (Books) Ltd., Leonard Hill House, Eden Street, London, N.W. 1.

PLANT AND EQUIPMENT

▶CONTINUOUS CENTRIFUGE

A new basket centrifuge introduced by Measuring and Scientific Equipment Ltd. is the Model 3,000 with a cake capacity of 3 litres and a throughput of 680 litres/hr.

It is said to be suitable for small scale production as well as for laboratory work. It is used with a perforated or unperforated basket head of 95/8 in. dia. which is available in either stainless steel or aluminium. The draining chamber is made of stainless steel and has a transparent plastic lid with an inlet pipe. The controls are grouped in one panel and consist of an on/off switch, speed control for stepless speed variation, electric speed indicator, and a pilot light.

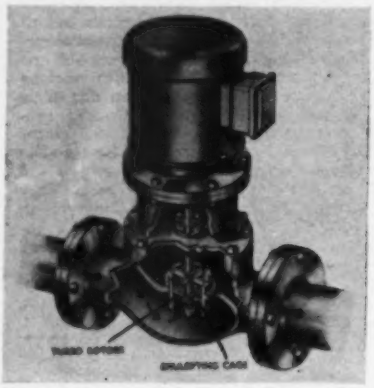
A sampling attachment can be supplied. It is used for taking either a sample or a continuous flow at any intermediate point between liquid intake and final caking. The sampling position is selected by turning a hand-wheel on top of the attachment, causing the collecting end of the sampling pipe to describe an arc from the centre of the basket outwards. When the sampling attachment is used, special vanes are required in the basket.

▶PIPE LINE MIXER

Wm. Boulton Ltd. have developed the *Thrumix* continuous pipeline mixer, a new unit which mixes fluids as they flow through a pipeline and dispenses with the need for large agitating vessels.

It is manufactured in sizes from 1 in. up to 6 in. bore and can be made in cast iron, stainless steel or the usual constructional metals. It can be inserted in a pipeline without the need for the introduction of bends or tees to accommodate it.

The mixer employs a high degree of shear and an easily obtained controllable degree of recirculation. It can be driven by small motors, ranging from ½-2 h.p., depending on requirements. Either a standard stuffing-box or mechanical seal is fitted. On high viscosity materials the throughput is approximately 14 gal./min., increasing on low viscosities to a maximum of 400 gal./min.



The Thrumix continuous pipeline mixer in position.

This basket centrifuge has a throughput of 680 litres/hr.

The mixer is suitable for continuous processes where an agitator tank is at a disadvantage. Applications include the combining of liquids, gases and solids, aeration of liquids and gas absorption, adding of lime and starch, the mixing of flocculants and sludge conditioning.

The unit is being made in two models; one with a fixed degree of recirculation, and the other with means for axial movement of the stator cage, which allows varying degrees of recirculation and controlled shear. This is claimed to be a very attractive feature, as it allows different degrees of mixing and blending depending upon materials being mixed.

These units range in price from £60 to £140. The manufacturers are offering a customers' trials and advisory service at their Burslem works at which firms' representatives may observe the tests.

▶ROTARY AIR-LOCK VALVE

It is claimed that the difficulty of mechanically feeding materials through a pressure differential while preventing air or gas from being fed with such materials has been overcome, by the Mikro Airlock, a rotary air-lock valve assembly now being manufactured by Pulverizing Machinery Ltd. It can be used as a discharger-device on cyclones, dust collectors and grinding mills. It can be used also to control the flow of materials from storage bins and silos and can act as a feeding-unit for pneumatic conveying systems, pulverizers, mixers and blenders.

The airlock consists of a fabricated cylindrical housing inside which rotary vanes slowly revolve, conveying material from an upper chamber and dropping it by gravity into a lower receptacle—such as a barrel, drum, case or any other discharge container. The rotary vanes are usually tipped with flexible plastic materials to provide a seal between these tips and the inside walls of the housing. There are new type vanes of various compositions available to meet varied requirements—all designed to prevent the feed materials from binding the rotor and to provide longer life and lower maintenance costs.

All the inside surfaces of the airlock are finished for close clearance. The straight-side inlet throat is ground and polished to prevent clogging, bridging or arching of the substance being handled. A packing gland at each end of the driving shaft stops dust leaks when the airlock is under pressure, or seepage of air or gas when the unit is under suction.

Both motor and drive, which can

be of the belt, chain, direct coupled or variable speed type, are located on the same side of the airlock unit so that the rotor may be easily removed for the replacement of vane tips.

The Mikro Airlock can be used for a variety of pressure change applications, and there is one basic housing design to cover this range. Three rotor designs are available—replaceable six vane rotor, replaceable or cast rigid eight vane rotor, and rigid twelve vane rotor, each suitable for a certain duty and each supported by removable outboard bearings.

The standard materials of construction are carbon steel/cast iron or stainless steel. Other materials can be used to suit special applications. The standard sizes available are 5 in., 8 in., 12 in., 18 in. and 24 in. dia., giving a complete output coverage from 10 to 6,500 cu. ft. per hr.

▶WATER CONTAMINATION METER

The Type 801A optical comparator has been developed by Electro Methods Ltd. for the continuous supervision of boiler feedwater. It can be used also to continuously supervise liquid distillate or, with modification, to monitor a gas stream. Special colour filters of polarised light can also be used to increase sensitivity to a particular property of the medium being monitored. The instrument is stated to have a sensitivity of 2 p.p.m.

The instrument is built in a metal box having two compartments. The top one contains the optical unit comprising two cylindrical chambers with fused silica windows in either end, together with a light source, reflecting mirrors and photo cells. Two light beams from a common source are reflected by spherical mirrors and focused on two vacuum type photo cells arranged in a ratio bridge circuit. The supply to the bridge is stabilised and the bridge temperature compensated. One of the liquid chambers is supplied with a reference solution, while through the other chamber the supervised liquid is passed continuously.

The minute globules of oil suspended in the condensate scatter the light beam and produce sufficient unbalance of a photo-sensitive bridge to operate the instrument. The bridge compares

Optical comparator for the continuous supervision of boiler feed water.

the two light beams derived from a common light source passing through the media to be compared. Inequalities caused by difference in light absorption or scattering in the test sample change the conductivity of the corresponding cell and give an output from the bridge which is amplified by a magnetic amplifier.

The indicating instrument may be replaced by a recorder or remote indicator. The equipment is made insensitive to disturbances of short duration; *e.g.* the passage of air bubbles, and small particles or momentary turbulence, by making the time constant of the amplifiers sufficiently long. The failure of the light source, which is totally enclosed is indicated by a light on the panel of the instrument which is actuated by a relay connected in series with the light source filament.

Mixing and filling machine for powders.

▶POWDER METERING AND MIXING

Accurate and speedy metering and mixing of powders and similar materials is claimed for powder filling machines and double conical mixers made by Alite Machinery Ltd. Powder ingredients are fed accurately through the loose powder filling machine which then meters the amount of material required. An infinitely variable control enables the quantity to be adjusted to between 1-100 lb. per hr. Each machine feeds its output into a common cross-feed spiral conveyor which carries the materials to the double conical mixer and pre-mixes them at the same time. The mixer normally has no baffles or blades, so the materials are not damaged by attrition or polarisation. The mixer is said to be easy to clean.

The input screw on the mixer extends just inside the machine and the materials fed to it fall immediately into the rotating chamber. The shaft carries on right through to the outlet where the blades of the outlet screw are recessed inside the mixer and carry on through to the discharge outlet. The outer case of the outlet screw is totally enclosed from the outlet of the mixer body, but is extended on the inside in the form of a trough which is adjustable to collect the correct amount of mixed material for discharge.

▶ARMOURPLATE GLASS TANKS

Armourplate glass tanks introduced by Q.V.F. Ltd. are made of polished plate-glass heat treated to increase mechanical strength and resistance to thermal shock. The manufacturers say that the only chemicals which will affect the glass are hydrofluoric and glacial phosphoric acids or strong caustic solutions. The tanks are constructed of precision - worked sheets of toughened glass secured by a rigid metal base frame with a framework of metal tension-rods.

NOTES AND NOTIONS

MILKMAN'S MUNCHAUSEN

FRANK J. CLARKE, managing director of Clarke-Built Ltd., a London firm of dairy engineers, has emerged as a modern Baron Munchausen. He won a tall story contest at a Chicago dairy exposition with a tale which would have made the Baron blench. I hasten to pass it on.

According to Mr. Clarke: "It is very well known that dairymen in London have tremendous difficulties to overcome when delivering milk during the foggy seasons, and research to overcome this has produced some startling results.

Cows are now being fed a diet which contains a phosphorus additive, and the resulting milk has a fog penetrating glow which provides the following benefits:

(1) The breath of the cows glows in the fog, making them easier to find for milking.
(2) The bottles of milk light up in the fog, making them easily visible on the customers' doorsteps.
(3) Adults and children who drink milk exude breath plainly visible in the densest fog, thus cutting down the accident rate.

Slogans issued by the Milk Publicity Council include 'DRINK MILK AND LIGHT YOUR WAY HOME,' and, a very popular one, 'GET LIT UP ON MILK.'"

For this remarkably sustained effort of pure invention the astounded Americans pressed on to Mr. Clarke the grand prize trophy—a gold-plated figure of a man throwing a bull over his shoulder!

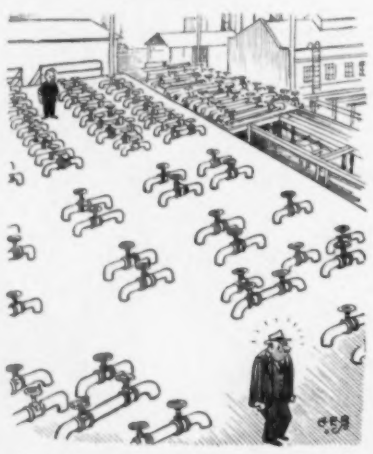
THE DOCTOR'S POSTBAG

SHOULD medical literature for circularisation to doctors be designed to appeal to the doctor or his secretary? This question springs from a survey among American doctors which disclosed that 26% had their post opened and screened by their secretaries or nurses. Half opened and read all their post themselves and about one-quarter asked their secretaries to open it but insisted on having it all passed to them. It seems, therefore, that to ensure all their mailings are read by the doctors addressed, medical copywriters will have to find a way of getting them through the feminine screen. Does this imply colours, pictures and headlines cunningly chosen to appeal to women? Or should the literature be made to look so formidably technical that the secretary will be intimidated and scared of not letting her boss see it? Certainly this survey cannot simplify the copywriter's work.

In Britain the problem may well be considerably smaller because far fewer doctors can afford secretaries or nurses. On the other hand this may mean that far more medical advertising is thrown away simply because the doctor hasn't got time to open it.

OTHER MEN'S MINDS

READING technical literature is part of the scientist's job and it is fallacious to think it can be dodged. Therefore I thoroughly approve of the American Chemical Society's series of advertisements which ram home this simple, inescapable duty. There is a great complaint that there are too many technical journals. Of course there are more than there were ten years ago. And in ten years there will be more still. But this is a consequence of the rapid expansion of knowledge. New sciences, new technologies and new industries demand new vehicles of information. As we learn more and become more literate so will journals multiply.



"TURN OFF WHICH ONE, DID YOU SAY?"

When people complain that there are too many technical journals it is because they have not bothered to get their reading organised. It is no good relying on the company librarian to select articles to be read and, very often, expect him to produce so-called "time saving" digests. In his "Last Essays of Elia" Charles Lamb wrote: "I love to lose myself in other men's minds. When I am not walking I am reading; I cannot sit and think. Books think for me." The scientist who lets a librarian read for him is also letting him think for him.

While on the subject of journals and reading, is it not time that industry adopted a less niggardly attitude towards subscriptions? Many firms expect one copy of a technical journal to be shared by a dozen or more of their staff. Some carry this pennywise policy to the extent of having their librarian make photostat copies of articles for circulation to their staff. Time and money could be saved by taking out a few extra subscriptions, thus ensuring that the staff get their essential reading promptly and in good condition. Individuals could help by buying a few technical journals themselves. Most cost less than a packet of cigarettes.

Cicerone

CORRESPONDENCE

Soap Additives

TO THE EDITOR.

SIR: In your December 1958 issue Mr. Leon Raphael stated that the incorporation of additives (*sci.* silicates and soda ash) into soap began only 30 years ago.

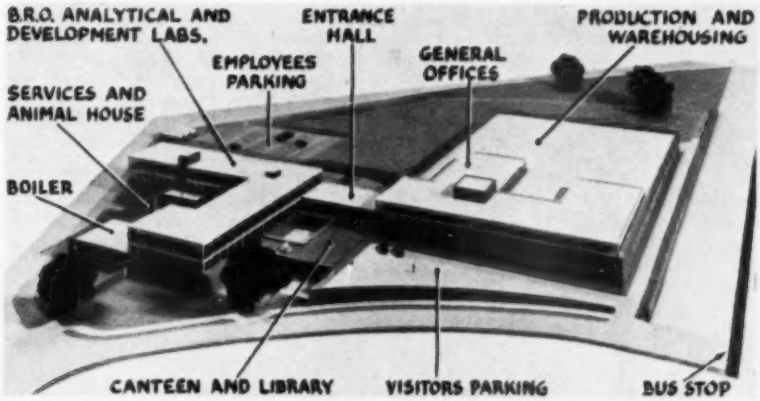
Mr. Raphael appears to have overlooked "The History of Unilever" by Charles Wilson. This book mentions (vol. I, pp. 120-1) two soap powders marketed about 50 years ago.

In "The Modern Soap and Detergent Industry" (vol. II, 2nd edn., 1931) Geoffrey Martin mentions an English patent granted to Harvey in 1903 for a soap powder containing sodium carbonate crystals, boric acid, boron nitride and ammonium chloride.

F. H. BELL.

Newcastle upon Tyne.

NEWS . . .



£1 million Laboratories for Smith Kline and French

Model of new pharmaceutical and research laboratories which Smith Kline and French Laboratories Ltd. are building at Welwyn Garden City. Manufacturing plant and offices will be included in the project, which will occupy 164,000 *sq. ft. on a* 9*-acre site. It is due to be completed in August at a cost of approximately* £1 *million. The company's chemical factory will remain at Tonbridge, Kent. This was described in* MANUFACTURING CHEMIST, *June* 1958.

Wellcome invest £640,000 in polio vaccine

The Wellcome Foundation has spent some £640,000 on poliomyelitis vaccine research and production. This was disclosed by the chairman, Mr. Michael Perrin, in his annual review. Since the Foundation is a private company the annual report and accounts are not normally published. Mr. Perrin's remarks have been released because of the special interest in *Polimylex* vaccine.

Mr. Perrin made it clear that Wellcome went into polio vaccine manufacture entirely on their own volition. There was never any question of a special contract with the Ministry of Health. However, the Ministry has agreed to take almost all the output of the Beckenham production unit,* now running at 4 million doses p.a. A small percentage is exported.

* Described in MANUFACTURING CHEMIST, December 1957, pp. 554-6.

Aerosol filling company formed

Safca Aerosol Manufacturing Ltd., and Commercial Plastics Ltd., will operate jointly as aerosol fillers and valve manufacturers. Safca has been renamed Aerosol Packaging Co. Ltd. and the new company will work solely on aerosol filling and packaging. The development, manufacture and marketing of the Safca valve will be handled by a new company, the Safca Aerosol Valve Co.

Both companies will remain members of the Thomas Tilling Group and will benefit from the experience and facilities of the Commercial Plastics Group. They will use a new sales office at 75 Grosvenor Street, London, W.1 (Telephone Grosvenor 8925).

Whitehaven acid plant to be enlarged

Solway Chemicals Ltd. are to expand their sulphuric acid and cement capacity at Whitehaven by 50%. The existing plant, which was started up in 1955, is producing both sulphuric acid and cement at the rate of 100,000 tons a year.

Solway is associated with Marchon Products Ltd. and both are subsidiaries of Albright and Wilson.

Paz Chemicals

Paz Chemicals Ltd., formerly known as the Shell Chemicals Distributing Co. (Middle East) Ltd., now have their registered offices at 1 Avery Row, Grosvenor Street, London, W.1 (telephone HYD 9261). Offices: 75, Grosvenor Street, W.1. The new Board of Directors consists of: I. Wolfson, *chairman*, Dr. J. Pomeraniec, *managing director*, S. Majaro, and D. I. Young.

Restrictions on antibiotics urged to combat staphylococcal outbreaks

Because they have been too successful antibiotics are now losing their power against bacteria. This paradoxical situation has arisen because, in spite of warnings, doctors have continued to use antibiotics indiscriminately with the result that organisms have become antibiotic-resistant and there are now serious outbreaks of staphylococcal infections in hospitals. Penicillin in particular now meets with limited success in the control of staphylococcal sepsis.

The situation is so bad that the Ministry of Health appointed a committee to recommend control measures. In a report published last month they say that the control of sources of infection may be hindered by the widespread or indiscriminate use of antibiotics and that clinicians should voluntarily restrict the use of these drugs.

The report stresses the need to rely on proper measures of asepsis and antisepsis rather than treatment by antibiotics. While it does not suggest any departure from established techniques in prevention it emphasises the need for co-ordination of preventive measures within the hospital and for adequate liaison with outside bodies such as public health departments and the general practitioner services.

Some of the detailed measures recommended are the use of gloves, masks and gowns; all members of the staff in attendance on patients should wash their hands before and after each item of service; blankets should be regularly disinfected; mattresses should be either regularly disinfected or protected from contamination.

Another maleic anhydride plant for Monsanto

Monsanto Chemicals Ltd., plan a big increase in maleic anhydride production. They have placed a contract with Scientific Design Co. Inc., of New York, to erect at Newport, Monmouthshire, a new plant to produce 15 million lb. p.a., using the S.D. process by which maleic anhydride is made by continuous catalytic vapour-phase air oxidation of benzene.

Rexall buy Carnegies

Rexall Drug Co. Ltd. have acquired the business of Carnegies of Welwyn Ltd., founded by Robert Beaton Carnegie in 1911. Mr. D. M. B. Carnegie and his family have ended their connection with the business.

Carnegies of Welwyn Ltd. will continue to operate in Welwyn Garden City as manufacturers of bulk chemicals. Production is to be increased and diversified.

The company has denied a rumour that, following the take-over, it will cease to make quinine.

Crop Protection and Pest Control Exhibition — 1959

Leonard Hill Limited announce that the next International Crop Protection and Pest Control Exhibition, organised by *World Crops*, will be held from Wednesday, December 9 to Friday, December 11, 1959, at the Seymour Hall, St. Marylebone, London, W.1.

This date has been chosen in response to many requests that the Exhibition should be held in the winter. In fact this year's Exhibition will coincide with the Smithfield Show when thousands of farmers will be in London.

The aim of the Exhibition is to cover all aspects of crop protection and pest control including:

Insecticides; Pesticides; Tree Bands; Fumigants; Rodenticides; Herbicides and Weedkillers; Fungicides; Sprayers and Applicators of all kinds; Cloches; Seed Treatments; Traps; Slug Killers; Insect Repellants; Bird Repellants; Timber Preservatives and Treatments; Protective Fencing; Bird Netting; Disinfectants; Aerial Spraying and other Protective Services.

Enquiries for stand space should be directed to the Exhibition Organiser, *World Crops*, Leonard Hill House, Eden Street, London, N.W.1.

Cost of optical whiteners

In the case of American detergents the cost of the optical bleaches present in the final product represent about 2% of the total cost of the raw materials. During the promotion stage of a new product, however—when it seems greater amounts of the bleaches are used—this cost may be increased up to about 5% of the total raw material present in the detergent. This is stated in the *Financial Times* in an article on optical bleaches which, it is said, are used in all major British synthetic detergents and soap powders except *Rinso* and *Lux*.

Evans Medical move

Evans Medical Supplies Ltd. have completed the transfer to their Speke works of all the manufacturing activities hitherto carried on at the Evans Pharmaceutical Laboratories, Fleet Street, Liverpool. In December 1958 the drug mill and extracts and tinctures section were moved and are now accommodated in spacious modern buildings, permitting of more efficient production. The Fleet Street laboratories have now been closed and all manufacturing activities on Merseyside are concentrated in the Speke works and in the Evans Biological Institute and Evans Fine Chemical Works at Runcorn.

New area office

The South-eastern area office of Birlec Ltd., manufacturers of heat treatment furnaces, dryers and gas plants, has been transferred to Crown House, Aldwych, London, W.C.2, telephone number: Temple Bar 8040.

In addition to providing a sales organisation and service facilities in the Greater London area, the new area office serves the counties of Middlesex, Essex, Kent, Surrey, Berkshire, Buckinghamshire, Bedfordshire, Hertfordshire, Cambridgeshire, Sussex, Hampshire, Huntingdonshire, Isle of Ely, Suffolk and Norfolk.

Import duty exemptions

The Treasury have made the Import Duties (Temporary Exemptions) (No. 2) Order, 1958, which provides that the goods listed in the Schedule shall be temporarily exempt from protective duties which came into force on January 1, under the Import Duties Act, 1958. The period of exemption is nine months unless a shorter period is indicated against any item in the Schedule. The goods include, under heading 29.08, the substance previously included in error under heading 29.07.

The Order came into operation on January 1, and has been published as Statutory Instruments 1958, No. 2224.

The Import Duties (Temporary Exemptions) (No. 3) Order revokes the exemption from import duty of calcium DL-pantothenate. Another new Order, (General) (No. 3), increases from 10% to 33⅓% *ad valorem* the duty on vitamin A (excluding natural vitamin concentrates) and on certain preparations containing that product, and reduces from 30% to 25% *ad valorem* the duty on certain glass bottles and jars. The purpose of the amendment is to reproduce more closely in the new tariff the previous liability to duty of these goods under the old tariff.

Boots' price reductions

Falling costs of raw materials and improvements in production facilities have made possible price reductions ranging from 6½% to 20% on eleven of Boots' branded medicinal and toilet products.

Oil-firing course

A three-day course on oil-firing will be held at the National Industrial Fuel Efficiency Service Office, Ailsa House, Kings Road, Reading, from April 14-16. Application forms and a syllabus are obtainable from the National Industrial Fuel Efficiency Service, 71 Grosvenor Street, London, W.1. Telephone: Hyde Park 9706.

New approved names

The following list of approved names for drugs was issued by the British Pharmacopœia Commission last month. If any of the drugs to which these names are applied should eventually be described in the B.P. the approved name will be its official title.

The issue of an approved name does not imply that the substance will necessarily be included in the B.P. or that the Commission recommends the use of the substance in medicine.

Among the "other names" in this list are some registered trade marks.

Approved name — *Other names*

BEPHENIUM HYDROXYNAPHTHOATE
Benzyldimethylphenoxyethylammonium 3-hydroxy-2-naphthoate
Alcopar

CHLORBETAMIDE
Dichloro - *N* - (2 : 4 - dichlorobenzyl) - *N* - (2 - hydroxyethyl)-acetamide
Mantomide; Pontalin

CHLORPROPAMIDE
N - *p* - Chlorobenzenesulphonyl - *N'* - propylurea
Diabinese

DIMETHISOQUIN
3 - Butyl - 1 - (2 - dimethylaminoethoxy)*iso*quinoline
Quotane is the hydrochloride

DITHIAZANINE
3 : 3'-Diethylthiadicarbocyanine
Delvex is the iodide; *Telmid* is the iodide

FLUOXYMESTERONE
9α - Fluoro - 11β : 17β - dihydroxy - 17α - methyl - androst-4-en-3-one
9α - Fluoro - 11ξ - hydroxy -17-methyltestosterone
Ultandren

GRISEOFULVIN
7 - Chloro - 4 : 6 - dimethoxycoumaran - 3 - one - 2 - *spiro* - 1' - (2' - methoxy - 6' - methyl*cyclo* - hex - 2' - en - 4' - one)
Grisovin

METHYLPREDNISOLONE
11β : 17α : 21 - Trihydroxy - 6α - methylpregna - 1 : 4-diene-3 : 20-dione
6α-Methylprednisolone
Medrol; Medrone

PHENACEMIDE
(Phenylacetyl)urea
Phenurone

STANOLONE
17β-Hydroxy-5α-androstan-3-one
Anabolex

STYRAMATE
2-Hydroxy-2-phenylethyl carbamate
Sinaxar

TRIFLUOPERAZINE
2 - Trifluoromethyl - 10 - [3' - (4" - methyl - 1" - piperazinyl)propyl]phenothiazine
Stelazine is the dihydrochloride

Index to the Supplementary List

(See the List for the full approved name and the chemical name.)

Proprietary name, etc.	*Approved name reference*
Alcopar	Bephenium
Anabolex	Stanolone
Delvex	Dithiazanine
Diabinese	Chlorpropamide
Grisovin	Griseofulvin
Mantomide	Chlorbetamide
Medrol	Methylprednisolone
Medrone	Methylprednisolone
Phenurone	Phenacemide
Pontalin	Chlorbetamide
Quotane	Dimethisoquin
Sinaxar	Styramate
Stelazine	Trifluoperazine
Telmid	Dithiazanine
Ultandren	Fluoxymesterone

Communications relating to approved names should be addressed to The Secretary, British Pharmacopœia Commission, General Medical Council Office, 44, Hallam Street, London, W.1.

Dearer cosmetics

Higher prices have been announced by Coty (England) Ltd. The new list covers perfumes, toilet waters, skin-care preparations and make-up.

Company finance

A final dividend of 15%, making an unchanged total of 20% for the year, is recommended by **Jeyes' Sanitary Compounds.** There is to be a two-for-five scrip issue.

Deosan factory sold

The Riddings, Derbyshire, factory of Deosan has been acquired by the Diversey Corp of Chicago. They will use the factory to increase their output of fertilisers, detergents and pharmaceutical goods.

Agents appointed

Fine Dyestuffs and Chemicals Ltd., Calder Street, Manchester 2, have been appointed the United Kingdom agents for Antara Chemicals. The company is now marketing *Antarox DJ*-970.

Advertising collaboration

Intercontinental Marketing Services Ltd. have accepted accommodation in the offices of Allardyce Palmer Ltd., 109 Kingsway, London, W.C. 2.

The move does not affect the status or the operations of either company. Each will continue to advertise on behalf of its own clients as before, I.M.S. largely to the medical profession, Allardyce Palmer to the industrial and consumer markets.

However, the link will, in certain cases, allow I.M.S. and Allardyce Palmer to jointly offer pharmaceutical clients facilities for both general and ethical advertising.

Shipment of dangerous goods

Amendment List No. 2 to the 1957 Report of the standing advisory committee on the Carriage of Dangerous Goods and Explosives in Ships is now on sale at H.M. Stationery Office, price 7s. 6d. net.

The alterations to Section 1 (the Explosives Section) of the Report have also been published separately as Amendment List No. 2 to the "Rules for the Packing, Stowage and Labelling of Explosives for Carriage by Sea" and may be obtained from H.M.S.O., price 3s. net.

New instrument laboratory

Construction has started on a new research laboratory at Cambridge for the Cambridge Instrument Co. Overlooking the river Cam, it will cover 20,000 sq. ft. The top floor will form a design and drawing office and the three floors below will be equipped for instrument work involving physics, chemistry, electronics and precision mechanical engineering. Completion is scheduled for next June.

The company's showroom at 13 Grosvenor Place, London, S.W.1, has also been redesigned and redecorated.

Sir Owen Wansbrough-Jones to open Corrosion Exhibition in April

Protecting hundreds of millions of pounds worth of Armed Forces' equipment against corrosion damage is a major task of Ministry of Supply scientists.

It is appropriate, therefore, that Sir Owen Wansbrough-Jones, K.B.E., C.B., PH.D., F.R.I.C., Chief Scientist of the Ministry, will open Britain's 1959 Corrosion Exhibition on Monday, April 27.

Sir Owen Wansbrough-Jones

Sir Owen was trained as a physical chemist at Cambridge under Sir Eric Rideal and at Berlin under Fritz Haber. Soon after the war started he was in the army, working on chemical warfare, but the scope of his work widened to embrace a variety of scientific and technical matters which he tackled as a General Staff Officer. He became Scientific Adviser to the Army Council in 1946. In 1950 he transferred to the Ministry of Supply as Director General of Scientific Research in respect of army requirements, and two years later was promoted to Chief Scientist.

Among his many outside interests, Sir Owen is Treasurer of the Faraday Society, a body which has done much for the study of corrosion, and, at the other end of the scale, he is concerned with practically the only field of metallurgy in which corrosion is no problem—the noble metals; he is a member of the Court of Assistants of the Goldsmiths' Company.

Over 80 firms are showing at the Corrosion Exhibition which will be open for four days, April 27-30, at the Royal Horticultural Society's New Hall, Westminster. Tickets are available from the organisers, "Corrosion Technology," Leonard Hill House, Eden Street, London, N.W.1.

Petroleum chemicals research

A new research unit which will specialise in petroleum chemicals, is being formed at the British Petroleum Co.'s research establishment at Sunbury-on-Thames, near London.

Anglo-German trade organisation

Ashe Laboratories Ltd. have inaugurated a new organisation to sell the company's products direct to the German retail trade. The company will work through a subsidiary, Ashe Laboratories G.m.b.H., Dusseldorf, and among the first products to be marketed will be *Quickstep*, a preparation for tinting, setting and conditioning the hair.

The directors of the German subsidiary are Mr. K. H. W. Young, who is export director of the parent company, and Mr. G. Neugebauer.

Conference on bacteriology

A Symposium on Lactobacilli will be a feature of the summer conference of the Society for Applied Bacteriology, to be held in London from July 7-9, 1959. Full details may be obtained from G. Sykes, the Hon. Secretary, Boots Pure Drug Co. Ltd., Microbiology Division, Standards Department, Nottingham.

Pharmaceutical Conference will be held at Bournemouth

The 1959 British Pharmaceutical Conference will be held in Bournemouth from September 21 to 25 inclusive.

The usual Science Sessions will be held for the presentation and discussion of papers dealing with original work on subjects of pharmaceutical interest. Contributions are invited. They may be either:

(i) a complete paper which should be as concise as possible—a maximum of 4,000 words is suggested, or

(ii) a short communication not longer than 1,000 words, or two pages of the *Journal of Pharmacy and Pharmacology* when complete with title, references, tables and figures.

The success of the discussions at the Science Sessions at the Conference depends on prior circulation of papers to members and it will not be possible to consider any manuscripts of either type of paper received after *June* 1.

Both "complete" papers and "short communications" should comply strictly with "Notice to Contributors" issued by the Editor of the *Journal of Pharmacy and Pharmacology*, a copy of which will be sent to any intending author on application.

Further information may be obtained from E. F. Hersant and D. Train, Hon. General Secretaries, British Pharmaceutical Conference, 17, Bloomsbury Square, London, W.C.1.

People

Richard Hudnut Ltd. have appointed **William J. Eastwood** as Cosmetic Export sales manager.

Mr. Eastwood previously held appointments with the Beecham Group and Pfizer Ltd. He will be based at the company's new head office in Eastleigh, Hampshire.

G. W. Riley has retired from the boards of George Scott and Sons (London) Ltd. and Ernest Scott and Sons Ltd. He will continue to serve the companies as technical consultant. He is in his sixtieth year of continuous service with both companies.

After almost 50 years with Geigy, **C. F. Gysin** retired at the end of 1958 as chairman of Geigy (Holdings) Ltd. of Manchester, and in consequence a number of changes have taken place in the boards of the companies of the Geigy group in Britain. **E. G. Turner** succeeds Mr. Gysin as chairman of Geigy (Holdings) Ltd., with **H. L. Addleshaw** continuing as deputy chairman. **H. Clayton** succeeds Mr. Turner as chairman of the Geigy Co. Ltd., with **H. Jones** as deputy chairman. Mr. Jones and **G. A. Campbell** become joint managing directors. Mr. Addleshaw succeeds Mr. Gysin as chairman of Ashburton Chemical Works Ltd. of Trafford Park, Manchester, with **Dr. F. Buchmeier** as managing director. On the board of James Anderson and Co. (Colours) Ltd. of Paisley, **A. H. Whitaker** succeeds Mr. Gysin as chairman and **A. A. R. Osbourne** and **Dr. D. M. Stead** become joint managing directors.

G. K. Hampshire, chairman of I.C.I's General Chemicals Division, and **Dr. J. S. Gourlay,** chairman of the Paints Division, have been appointed to the Board of I.C.I.

Mr. Hampshire was born in 1900 and educated at Leeds Grammar School and Magdalen College, Oxford, where he gained first-class honours in chemistry. He joined Brunner Mond —one of the original constituent companies of I.C.I.—in 1923.

Dr. Gourlay was born in 1905 at Stevenston, Ayrshire. He went to Stevenston School from 1910 until 1919, when he obtained a post as a laboratory apprentice with Nobels' Explosives Co. Ltd. at Ardeer. Through the part-time science course then run by the company in association with the local education authority and the Royal Technical College, Glasgow, he gained a B.Sc., an external degree from London University and was elected an associate of the Royal Institute of Chemistry in 1930. In 1929 he was transferred to the Stowmarket factory

J. Timperley

Miss L. E. Sargent

of Nobel Chemical Finishes Ltd. and in 1935 he was awarded a Ph.D. from London University for a thesis on the "Viscosity relationship of nitrocellulose solution."

H. P. N. Benson has been appointed deputy managing director of the A.P.V. Co. Ltd.

J. Timperley, A.R.I.C., has been appointed Northern Area technical representative by Honeywill and Stein Ltd. in their capacity as sole selling agents for Honeywill-Atlas Ltd. Mr. Timperley lives in Manchester and his services will be available to customers of both companies in the north of England.

Miss L. E. Sargent has been appointed sales representative of Betts and Co. Ltd. for the Greater London area. Miss Sargent, who joined the company on January 1 of this year, was buyer for Coty (England) Ltd. for 13 years and from 1946 to 1954 she was buyer for Elizabeth Arden Ltd.

K. R. Fox has joined Riker Laboratories Ltd. as Publicity Manager. Previously, he was with Abbott Laboratories. **Mrs. P. C. Turnbull** has joined the staff of the medical information department. She was formerly with the Scientific Department of the Pharmaceutical Society.

R. W. Beckwith, W. H. Calvert, W. H. P. Clarke, and **F. L. Thomas** have been appointed to the representative staff.

A. E. B. Lloyd and **S. S. Howard** have been appointed joint managing directors of Barclay & Sons Ltd., wholesale chemists, of Brighton. Mr. Lloyd has been associated with the pharmaceutical profession all his life and is a grandson of the late T. Howard Lloyd, founder of Howard Lloyd and Co. Ltd., manufacturing chemists. Before taking up this appointment he was London manager of Hyde and Entwistle Ltd., wholesale chemists, of Belfast and has held appointments with E. R. Squibb and Sons and May and Baker Ltd.

Lord Ferrier of Culter has joined the board of Duncan, Flockhart and Co. Ltd., and has been elected chairman of the company.

John Acton, M.SC., has been appointed new products manager of Midland Silicones Ltd. This is a new post. He will be responsible for launching and marketing all new silicone products.

The Earl of Halsbury and **Sydney Barratt,** chairman of Albright and Wilson Ltd., have been invited to join the board of Joseph Lucas (Industries) Ltd., on April 1. The Earl of Halsbury will retire from the managing directorship of the National Research Development Corporation at the end of March.

Esso Petroleum Co. Ltd. announces that **H. C. Tett,** formerly a managing director and chief executive, has been appointed chairman and managing director following the retirement of **Sir Leonard Sinclair.**

Mr. Tett was born at Exeter in 1906. At the Royal College of Science, London, he graduated with honours in physics and was awarded a B.Sc. He was later awarded the Diploma of Imperial College for research work on combustion and tetra-ethyl lead. He joined Esso in 1928 as an assistant in their technical sales department.

Dr. T. L. Cottrell has succeeded **Prof. J. P. Kendall** as Professor of Chemistry at Edinburgh University. Dr. Cottrell graduated at the University in 1943 and joined I.C.I. Nobel Division Research Department immediately thereafter. In 1946 he was seconded to Oxford University Physical Chemistry Laboratory, returning to I.C.I. in 1948. He was appointed head of the Physical Chemistry Section of I.C.I. Nobel Division in 1949 and left in 1957 to become personal assistant to Sir Ewart Smith, a deputy chairman of I.C.I. He is 35.

Norman C. Jeffery, M.P.S., has been elected president of the Proprietary Articles Trade Association for 1959. He has represented The British Drug Houses Ltd. on the manufacturers' section of the council since 1947. Mr. Jeffery qualified as a pharmacist in 1935 and after three years in retail practice joined The British Drug Houses Ltd. In 1947 he was appointed merchandising manager to B. D. H., which appointment he still holds.

H. Murray, B.SC., manager of the pharmaceutical and dyestuffs department of Joseph Weil and Son Ltd., has been elected a F.R.I.C.

J. Arthur Reavell, the chairman of Kestner Evaporator and Engineering

Co. Ltd., and Mrs. Reavell are now touring their South African company's offices and associated plants. They are due to return to England on April 3.

Dr. E. M. Morgan has been appointed research manager at the Parke-Davis Hounslow laboratories. In this new post he will administer chemical and pharmacological research, production development and clinical investigation. Dr. Morgan graduated as B.Pharm. from the University of Wales, and is a Ph.D. of London University. He has been with Parke-Davis since 1951. Another new P-D. appointment is that of **S. G. Davis** as superintendent of production. As an analyst, a member of the products development group and finally as assistant to Mr. W. Waterman, Ph.C., the retiring superintendent of production, Mr. Davis has been with P-D. for many years. He qualified as B.Pharm. from the University of Wales and worked in retail pharmacy before choosing an industrial career.

W. J. Piggott retired from the Board of Laporte Industries Ltd. on March 31, because of ill-health, after 52 years of continuous service. **The Hon. F. A. Leathers** and **Prof. F. S. Spring,** F.R.S., have been appointed directors. Prof. Spring, at present Freeland Professor of Chemistry at the Royal College of Science and Technology, Glasgow, will take up the executive appointment of director of research of the Laporte Group on July 1, 1959.

V. W. Slater, a director, will continue as chief chemist of the Group.

Obituary

Prof. William Wardlaw, president of the Royal Institute of Chemistry, died on December 16 aged 66. After being a lecturer in inorganic chemistry at Birmingham University, he was appointed professor of physical chemistry at Birkbeck College, London, in 1937 and there he remained until his death. He was president of the Chemical Society from 1954 to 1956 and became general secretary of the British Association in 1955. During his illness the duties of president of the R.I.C. were carried out by Dr. Kent-Jones, a former president.

Advisory offices opened

European sales and advisory offices have been opened by National Chemical Products Ltd., an associate company of the Distillers Co. Ltd., at 172-3 Tottenham Court Road, London, W. 1. to deal with technical and commercial enquiries concerning the South African distillers' dried solubles which are now being introduced to the European animal feed industry.

The offices will be under the direction of Mr. J. A. Wakelam, formerly nutritional adviser to the Distillers Co. (Biochemicals) Ltd. The telephone number is Euston 4400.

Meetings

Pharmaceutical Society

February 18. "Pharmaceutical Aspects of Crop Protection and Pest Control," by Dr. S. B. Challen. 7.30 p.m. 17 Bloomsbury Square, London, W.C.1.

Society of Chemical Industry

March 2. "Colonial Research—Products and Pesticides," by Dr. R. A. E. Galley. 6.30 p.m. 14 Belgrave Square, London, S.W.1.

Royal Institute of Chemistry

February 10. "Vitamin B_{12} — Recent Advances," by Dr. E. Lester Smith. 6.30 p.m. Sir John Cass College, Jewry Street, London, E.C.3.

February 18. "Chemical Aspects of Fire Prevention," by Dr. F. E. T. Kingman. 6.30 p.m. King's College, Strand, London, W.C.2.

March 5. "Automation in Analysis," by D. A. Patient. 7.30 p.m. Medway College of Technology, Maidstone Road Chatham.

Institution of Chemical Engineers

February 12. Symposium on Mass Transfer. "Mass Transfer to Drops of Liquid Suspended in a Gas Stream." 9.30 a.m. Church House, Great Smith Street, London, S.W.1.

March 4. "Reynold's Analogy and Mass Transfer," by Prof. F. H. Garner, V. G. Jenson and R. B. Keey. 6.30 p.m. Birmingham College of Technology, Gosta Green, Birmingham.

The Chemical Society

LONDON

February 12. "Polyacetylenes," by Prof. E. R. H. Jones. 7.30 p.m. Imperial College of Science and Technology, South Kensington, S.W.7.

February 26. "The Origin of the Elements," by Prof. F. Hoyle. 7.30 p.m. The Royal Institution, Albemarle Street, S.W.1.

ABERDEEN

February 12. "Ion-exchange Resins and Membranes," by F. L. Tye. 7.45 p.m. Marischal College.

DURHAM

February 23. "Chemistry of Insulin," by Dr. F. Sanger. 5 p.m. Science Laboratories, The University.

EDINBURGH

February 19. "Structural Analysis of Polysaccharides," by Dr. D. J. Manners. 7 p.m. North British Hotel, Edinburgh.

ST. ANDREWS AND DUNDEE

February 13. "The Search for New Drugs," by Dr. H. T. Openshaw. 5.15 p.m. St. Salvator's College, St. Andrews.

SOUTH WALES

March 2. "Chemistry of Vitamin B_{12}," by Prof. A. W. Johnson. 5.30 p.m. Universtiy College, Cardiff.

Society for Analytical Chemistry

February 20. A.G.M. of the Microchemistry Group. 6.45 p.m. School of Pharmacy, 29/39, Brunswick Square, London, W.C.1.

March 3. A.G.M. of the Midlands Section. 6.30 p.m. Mason Theatre, the University, Edmund Street, Birmingham, 3.

U.S. buys more British drugs—but total exports fall

British drug and medicine exports to the U.S. in 1958 reached the record figure of £1,100,000, compared with £830,000 in 1957. Exports to Egypt recovered, from £84,000 to £494,000, and the industry believes that the signing of the Anglo-Egyptian financial agreement will lead to considerably more sales in this market.

Nigeria, New Zealand, the Irish Republic, Pakistan, U.S.A. and Canada all bought more British pharmaceuticals last year. But there was a slight fall in exports to some countries; the financial crisis and import restrictions in India, for instance, resulted in a fall in exports to that country from £2·9 million to £1·7 million. The total exports were £37·8 million compared with the record figure of £39·6 million reached in 1957.

Antibiotics accounted for the biggest export sales, £8·3 million, with vitamins next, £2·5 million. Exports of alkaloids, aspirin and sulphonamide preparations each exceeded £1 million.

EXPORT OF BRITISH DRUGS AND MEDICINES—1958

£ million

	1958	1957
Main markets		
Australia	3·3	3·4
Nigeria	2·1	1·8
New Zealand	1·9	1·8
South Africa	1·8	1·8
India	1·7	2·9
Irish Republic	1·6	1·5
Pakistan	1·5	1·3
U.S.A.	1·1	0·83
Ghana	0·97	0·97
Canada	0·96	0·72
China	0·9	1·0
Burma	0·85	1·4
Belgium	0·77	0·93
Main items		
Vitamins	2·5	3·2
Antibiotics	8·3	8·6
Alkaloids	1·3	1·3
Aspirin	1·1	1·2
Anti-histaminics	0·46	0·54
Synthetic anti-malarial drugs	0·82	1·0
Barbiturates	0·56	0·61
Ointments and liniments, not elsewhere specified	1·2	1·3
Insulin	0·50	0·41
Sulphonamide preparations	1·2	1·2
Proprietary medicines, not elsewhere specified	10·6	10·8

News from Abroad

HOLLAND

Perfumery merger

Polak and Schwarz of Zaandam and van Amerigen-Haebler of New York have amalgamated to become a new organisation — International Flavor and Fragrances Inc. P. and S. of Zaandam will operate as part of the new organisation under the name Polak and Schwarz International N.V.

New research laboratory

A new research laboratory for N.V. Koninklijke Pharmaceutische Fabrieken v/h Brocades Stheeman and Pharmacia has been opened at Haarlem by Prince Bernhard of the Netherlands.

BELGIUM

Croda's new factory

A new factory at Verviers for Croda Belge S.A. was opened last month by the Minister of Economic Affairs, M. J. Van Der Schueren. The new plant is said to be the most modern lanolin plant in the world and is large enough to supply all the requirements for lanolin of the Benelux countries. It has been designed to ensure that production can be expanded rapidly if further markets are to be served from Belgium.

Polyethylene plant

A new company, Cobenam S.A., has been formed to manufacture polyethylene. It will be jointly owned by Union Carbide Corp. and Société Chimique des Dérives du Pétrole S.A. Plans call for the construction of a plant having an initial capacity of 30m. lb. of polyethylene annually with production estimated to commence in mid-1960. The plant will be near Antwerp between the Petrochim chemical plant and the Société Industrielle Belge des Pétroles (SIBP) refinery. Raw materials will come from SIBP. Technical " know-how " will be provided by Union Carbide.

Cobenam S.A. will represent the third Union Carbide investment in European polyethylene production facilities.

GERMANY

Cough drug condemned

The West German Government has been condemned by the Central Opium Board for allowing unrestricted sales of *Ticarda*, a cough preparation containing normethadone, a synthetic drug liable to cause addiction. In this respect it is said to be as dangerous as morphine.

The West German Government is not bound to control sales of normethadone as it is not a party to the 1948 protocol to the international narcotic drug conventions, under which normethadone was brought under control in 1954.

SOUTH AFRICA

Search for new drugs

The National Chemical Research Laboratory of the Council for Scientific and Industrial Research is to survey South African plants in the hope that it will lead to the discovery of new drugs of medical value. South Africa possesses one of the richest floras in the world, but very few of its plants have been investigated.

The work is being supported financially by an American pharmaceutical firm.

UNITED STATES

Colgate buy hair tonic firm

Colgate-Palmolive Co. have acquired the Wildroot Co. Inc. by an exchange of shares

Wildroot cream oil hair tonic is the largest-selling hair tonic in the United States. The company has offices and a factory at Buffalo, New York, where 250 people are employed. It has a Canadian subsidiary at Fort Erie, Ontario.

Wildroot will continue as a subsidiary of Colgate.

Sulphur exports rise as home demand falls

United States sulphur producers, hit by a recession in domestic markets, were able to increase exports in 1958 to 1,575,000 tons, which is slightly higher than in 1957 and only 75,000 tons below the record shipped in 1956. Sulphur output from all sources in the U.S. amounted to 6,200,000 long tons, compared with 7,000,000 tons in 1957. The drop in production was the result of lower consumption, increased imports (760,000 tons against 669,000 in 1957) and a cut in stockpiling.

To meet more effectively increased competition abroad from foreign sulphur, the four U.S. Frasch producers during the year formed the Sulphur Export Corporation to sell their sulphur outside the North American continent.

The quoted price of sulphur in the U.S. has remained unchanged since the reduction of $3 a ton effected late in 1957. Prices during 1958 were quoted at $25 a long ton f.o.b. port and $23.50 f.o.b. mine.

Two new U.S. salt dome deposits were under development in 1958, both projects of Freeport Sulphur. The largest is Grand Isle, a major discovery seven miles off the Louisiana coast in 50 ft. of water. The second—Lake Pelto—is some miles away in the shallow, partially protected water along the coast. At Grand Isle production is expected in 1960.

New petrochemicals plant

The American Chemical Corp. is to build this year a petrochemicals plant costing $7½m. The company is jointly owned by Richfield Oil Corp. and the Stauffer Chemical Co. The new plant will be sited near Richfield's refinery in Watson, California.

New labels for hazardous household products

A Hazardous Substances Labelling Bill has been prepared by the Manufacturing Chemists' Association, Chemical Specialties Manufacturers' Association, the American Petroleum Institute and the National Paint, Varnish and Lacquer Association. It is intended to provide a sound legislative pattern on both the Federal and State level for informative precautionary labelling of hazardous substances intended or suitable for household use.

The bill requires in addition to the other precautionary information the word " poison " on substances defined as highly toxic.

Each container of a hazardous substance must on its label state, among other things, the name of the hazardous ingredient, which will facilitate treatment in case of accidental injury.

The label must also contain a signal word—*danger*, *warning* or *caution*—a statement of the hazard, and a statement of measures to be taken or acts to be avoided in the handling, use and storage of the product.

Every container of a hazardous substance must carry on its label the statement " Keep Out Of The Reach Of Children " or its practical equivalent.

The bill has been designed to supplant the Federal and State Caustic Poison Acts which have become obsolete.

ISRAEL

First nitric acid plant

Fertilisers and Chemicals Ltd. in Haifa have put into operation a new plant which will produce nitric acid for the first time in this country. The new plant has a capacity of 22,000 tons p.a. of industrial nitric acid of a concentration of 58%. This will mainly be used in the manufacture of nitrogenous fertilisers; the manufacturers will also use it in the production of ammonium nitrate fertilisers in a new factory to be commissioned in the near future.

NEW PRODUCTS

Anti-hæmophilic globulin

A new preparation for treating hæmophilia has been introduced by Crookes Laboratories. Known as AHG, anti-hæmophilic globulin, it is prepared from pigs' blood which is nearly 20 times as potent in its anti-hæmophilic properties as human blood transfusions which up to now have been standard treatment. The product is in the form of a white powder and is administered by transfusion.

At present the globulin is antigenic and hæmophiliacs can be treated with it only once, but it is hoped that this problem will be overcome soon.

★

Opoponax specialities

Dragoco have introduced four new opoponax bases. These are 09091 *opoponax*, said to be an ideal undertone for all perfumes of the chypre and fougère type and to be also well suited to powder perfuming; 02762 *opoponax extra D*, a harsh, spicy perfume; 09090 *opoponax*, recommended as a modifier of Cologne compounds and fougère scents; and 09089 *opoponax extra*, suitable for exotic perfumes.

★

Solid nonionic detergent

What is claimed to be the first solid nonionic detergent with cleaning power equal to that of liquid nonionics has been developed by Antara Chemicals, a division of the General Aniline and Film Corporation. The new surfactant, Antarox DJ-970, is designed for use in heavy duty detergent formulations for either home or industrial use. Detergents based on the product are said to be as effective as detergents based on liquid nonionics. In addition, they may be of the low-density, free-flowing type.

Unlike many nonionics, the new surfactant does not go through a strong gel phase while going into solution and, therefore, may be diluted more rapidly and with less trouble and because of its high melting point and brittleness, it can be dry-blended in either ribbon blenders or tumbler mixers. Antarox DJ-970 is also frangible enough to be broken down into the same particle size as the other ingredients to give a uniform, free-flowing powder.

The product has also been experimentally proven to be effective in preventing the formation of lime-soap curds—"bathtub ring."

Antarox DJ-970 is composed of alkylphenoxypoly (ethyleneoxy) ethanols. Slightly off-white in colour, it is soluble in water, aromatic solvents, methanol and ethanol, and is nearly neutral in *p*H. It is said to be virtually nontoxic in formulated products.

Selling agents are Fine Dyestuffs and Chemicals Ltd., Manchester 2.

First and second prizes in the "Caption this Poster" competition, organised by the Royal Society for the Prevention of Accidents, were won by Mr. W. L. Jones, of Murgatroyd's Salt and Chemical Co. Ltd. The first prize caption is shown on the poster above. The competition was part of the Society's National Industrial Safety Week, which focused industry's attention on "Falls of Persons."

NEW COMPANIES

These particulars of new companies have been extracted from the daily register of Jordan and Sons Ltd., company registration agents, Chancery Lane, London, W.C. 2.

Richmond Chemists Ltd. 27.11.58. 19 Buckingham St., London, W.C.2. £1,000. Sub.: C. E. Richmond, 6A Eastern Terrace, Brighton, Sussex.

Grenvite Ltd. 27.11.58. Chemists. £100. Sub.: T. A. Herbert, 156 Strand, London, W.C.2.

Ross Laboratories Ltd. 27.11.58. 16A Sackville St., London, W.1. Mnfrs., agents, exporters and importers of all kinds of toilet specialities, chemists' and hairdressers' sundries, etc. £100. Dirs.: J. and Mrs. A. R. Saville, Margaret R. Allen and O. N. T. Davenport.

A. Atkinson and Co. Chemists (Southend) Ltd. 1.12.58. 71 High St., Southend-on-Sea. £5,000. Dirs.: L. C. and Anita Graham.

S. Grundy and Co. (Hygiene) Ltd. 2.12.58. 26 Oxford St., Newcastle upon Tyne 1. Mnfrs. of and dlrs. in chemicals, gases, drugs, medicines, etc. £100. Dirs.: Edith Grundy and R. O. Wylde.

D. E. Fisher (Chemists) Ltd. 28.11.58. 75 London Rd., Neath, Glam. £3,000. Dirs.: D. E. Fisher and Mrs. O. A. Court.

Medlon Ltd. 3.12.58. Mnfrs. and mchts. of perfumes, essences, powders, dyes, salves, ointments, etc. £500. Dirs.: M. J. E. Mathe, 9 Hurst Way, South Croydon, Surrey, J. P. Mathe and T. L. T. Thompson.

W. M. Bradshaw and Son Ltd. 3.12.58. 406 Bank Chambers, 329 High Holborn, London, W.C.1. Chemists and druggists. £7,500. Dirs.: Dora M. Bradshaw (permnt.), R. Bradshaw and J. R. Connor.

Southern Polymers Ltd. 5.12.58. 139 Tottenham Court Rd., London, W.1. Mnfrs. and dlrs. in polymers, chemicals, etc. £100. Dir.: M. Striker.

Knight and Son (Chemists) Ltd. 11.12.58. 13 Market Place, Wincanton, Som. To take over bus. cd. on as "Knight and Son" at Wincanton, Som. £100. Dirs.: A. H. Knight and W. B. Rhodes.

Technical Press Review—February

Chemical and Process Engineering.—Review of Mixing Machinery; Can Calcium Carbide Be Made in New Zealand?; Analogue Computers in Chemical Engineering—3.

Corrosion Technology. — Corrosion Research in Singapore; Pipeline Protection in the Middle East—2; Special Issue: Pipe Wrappings.

Automation Progress.—Automatic Control of Effluent Neutralisation; Measurement and Control of Processes; Process Control by Computer; Data Sampling—Theory and Practice; Hydraulic Valves for Aero Engine Test Plant; Tape Control for Measurement and Machining—2; Cost Accounting in Conditions of Automation; German Control Engineering Activities.

Petroleum. — Petrochemical Production at Fawley; Solid Petroleum Hydrocarbons and their Effect on Wax Properties; Gas Chromatography in the Oilfield; Stress Relieving in the Field; Asbestos in the Oil Refinery; Welding Techniques and Electrodes for the Oil Industry.

Atomic World.—Nuclear Energy in Benelux Countries; Isotopes in Underground Gasification.

Paint Manufacture. — Paint Industry in Scandinavia; Packaging Inks for Film and Foil; Hazards in Paint Factories; Behaviour of Paints in the Tropics.

Food Manufacture. — Experiments in Cooking Sardines—1; Technology of Smoked Foods; Instruments in the Food Industry; Annual Reviews: Ice Cream; Meat; The Baking Industry.

Dairy Engineering. — Instrument Control for Dairy Automation—1; Instrumentation for Automatic In-place Cleaning; Instruments for the Dairy Industry; Processed Milk and Milk Products for the South Pacific; Transport of Milk by Road—3.

World Crops.—Weed Control in Temperate Regions; Potato Blight; Weed Control in the Tropics; Protection Against Termites; Aerial Spraying.

THE CHEMICAL MARKET

PRICE CHANGES MAINLY UPWARDS

LONDON.—Price increases predominate this month but there are three minor reductions: **Ferri ammonium citrate BP** is down by 1½d. lb., **thiamine** (kilo lots) by 32s. 6d. kg., and **vanillin** by 6d. lb. **Bismuth oxide BPC** is up 5d. lb., **codeine phosphate** by £10 kg., **silver nitrate** by 7/16d. oz., **arsenic** by £4 ton, **calcium chloride** by 2s. 6d. ton, **caustic soda** by 24s. ton, **soda ash** by 15s. ton, and **sodium silicate** (1-ton lots) by £2 ton. **Gums and waxes** show the usual fluctuations in price.

FINE CHEMICALS

Acetanilide 12½ kg. 7s. 4d. kg.

Arsenious oxide B.P.
- 7-lb. lots 1s. 9d. lb.
- 1-cwt. lots 1s. 2d. lb.

Ascorbic acid
- 100 kg. £4 14s. kg.

Aspirin
- 56 lb. 5s. 2d. lb.
- 1-cwt. 4s. 11d. ,,
- 5-cwt. lots 4s. 9d. ,,

Atropine
- Sulphate, 500 g. £59 18s. 6d. kg.
- Alkaloid, 500 g. £69 10s. kg.

Benzene B.P.C. 28-lb. lots 1s. 8d. lb.

Benzoic acid 12½ kg. 7s. 4d. kg.

Benzyl benzoate
- According to pack 5s. to 5s. 6d. lb.

Bismuth oxide B.P.C. 1934
- 28-lb. lots 27s. 3d. lb.

Bismuth salts 28-lb. lots:
- Carbonate 22s. 3d. lb.
- Subgallate 21s. 1d. ,,
- Salicylate 21s. 9d. ,,
- Subnitrate 20s. 5d. ,,

Borax B.P.
- Powder £57 10s. ton
- Extra fine £58 10s. ,,

Boric acid B.P.
- Crystal £95 10s. ,,
- Powder £93 ,,

Bromine B.P.C. 7-lb. lots 6s. lb.

Caffeine 50 kg. 42s. 6d. kg.

Calamine 50 kg. 4s. kg.

Calcium gluconate
- 1 cwt. lots dlvd. 3s. 7d. lb.

Calcium glycerophosphate
- 50 kg. 28s. 6d. kg.

Calcium lactate B.P.
- 7-lb. lots 3s. 6d. lb.
- 1-cwt. lots 2s. 11d. ,,

Chloral hydrate 50 kg. 10s. kg.

Citric acid, B.P. Powder or granulated:
- 1-cwt. lots £11 5s. cwt.
- 5-cwt. lots £11 ,,

Codeine
- Alkaloid 100 g. £138 10s. kg.
- Phosphate 100 g. £110 ,,

Cream of tartar
- 1-cwt. lots £11 15s. cwt.
- 5-cwt. lots £11 13s. ,,

Ephedrine 500-g. lots
- Hydrochloride 3 kg. £7 9s. 11d. kg.
- Alkaloid 3 kg. £12 7s. kg.
- Sulphate 3 kg. £7 9s. 11d. ,,

Eucalyptol
- 1-cwt. lots 11s. lb.
- 5-cwt. lots 10s. 6d. ,,

Ferri ammonium citrate B.P.
- 1-cwt. lots, scales 4s. 5½d. lb.
- 1-cwt. lots, granules 3s. 7½d. ,,

Ferrous gluconate
- 1-cwt. lots dlvd. 6s. 3d. lb.

Gallic acid B.P.C.
- 1-cwt. lots 10s. ,,

Gluconic acid technical 50%
- Minimum 12-gal drums 19s. gal., drums extra, returnable

Glucono delta lactone
- 1-ton lots delvd. 5s. net lb.

Glycerophosphoric acid
- 24 litres 11s. 10d. litre

Glycine (amino acetic acid)
- 12½ kg. 18s. 10d. kg.

Hexyl resorcinol 10 kg. £7 10s. kg.

Hydroquinone 12½ kg. 23s. 10d. kg.

Iodides
- Ethyl 4 kg. bottles 62s. 9d. kg.
- Mercury, red B.P.C. 28-lb. lots 27s. 1d. lb.
- Potassium B.P. 28-lb. lots 8s. 0d. ,,
- Sodium B.P. 28-lb. lots 13s. ,,

Iodine, Chilean crude, 99% min. in wooden casks 15s. kg.

Iodoform
- 12½ kg. and under 50 kg. 42s. 6d. kg.

Lactose 50 kg. 3s. 2d. kg.

Lithium salts 5-cwt. lots
- Benzoate 10s. lb.
- Carbonate B.P.C. 11s. 3d. ,,
- Chloride (commercial) powder 11s. ,,
- ,, granular 10s. 9d. ,,
- Hydroxide 9s. 9d. ,,
- Citrate B.P.C. 9s. ,,
- Sulphate 8s. 6d. ,,
- Salicylate, 10 cwt., dlvd. 9s. 9d. ,,

Magnesium carbonate B.P.
- Light cwt. lots dlvd. £129 ton

Magnesium trisilicate 28-lb. packs
- 28-lb. lots 4s. 3d. lb.
- 1-cwt. lots 3s. 10d. ,,
- 5-cwt. lots 3s. 7d. ,,
- Bulk rates for larger quantities are from 3s. 1d. lb. in 1-ton lots

Manganese hypophosphite B.P.C.
- 7-lb. lots 13s. 11d. lb.
- 1-cwt. lots 12s. 11d. ,,

Mercuric chloride B.P.
- 50-kg. lump 48s. 6d. kg.

Methyl salicylate 1-cwt. lots 3s. 3d. lb.

Morphine
- Alkaloid, 100 g. £138 18s. 4d. kg.

Nicotinamide 1 kg. £3 15s. kg.

Nicotinic acid
- 12½ kg. 52s. 6d. kg.
- 1 kg. 55s. ,,

Oleine, B.P. extra pale, 3/4 cwt. drums returnable carriage paid G.B. £160 ton

Phenolphthalein 50 kg. 24s. 3d. kg.

Phosphoric acid B.P.
- (s.g. 1·750) 10-carboy lots 1s. 4d. lb.

Potassium permanganate B.P.
- 1-cwt. lots dlvd. 1s. 11½d. lb.

Procaine hydrochloride (foreign) 2 kg. 59s. kg.

Quinine 1-oz. lots 4s. 4d. oz.

Riboflavin
- 100 g. 5½d. g.
- 10 g. 7d. ,,

Saccharin
- 500 g. £7 4s. for this quantity

Salicylic acid
- B.P., dlvd. 3s. 2½d. to 5s. 6d. lb.

Silver nitrate
- 500 g. 5s. $0\frac{1}{10}$d. oz.

Sodium benzoate B.P.
- 1-cwt. lots 2s. 9½d. lb.
- 1-ton lots 2s. 7½d. ,,

Sodium gluconate technical
- 3-cwt. lots delvd. 3s. net lb.

Sodium salicylate
- 50 kg. 8s. 8d. kg.
- 12½ kg. 9s. ,,

Sodium thiosulphate
- Crystals, photographic quality 1-ton lots 49s. cwt.

Stearic acid B.P.C. flake, carriage paid G.B. £154 ton

Strychnine 25 oz.
- Alkaloid 8s. 6d.
- Hydrochloride 8s. 6d.
- Sulphate 7s. 6d.

Sulphaguanidine
- 12½ kg. 33s. kg.
- 50 kg. 32s. ,,

Sulphanilamide
- 12½ kg. 16s. 6d. kg.
- 50 kg. 15s. 4d. ,,

Sulphathiazole 12½ kg. 39s. 9d. kg.

Tannic acid B.P. Levis
- 1-cwt. lots 10s. lb.

Tartaric acid B.P.
- Powder or granulated, 10 cwt. or more £14 10s. cwt.

Terpineol B.P.
- 40-gal. drums 2s. 4½d. lb.
- 1-cwt. lots 2s. 7d. ,,

Theophylline B.P.
- 500 g. 27s. 6d. for this quantity

Thiamine hydrochloride
- 100 g. 4d. g.
- 1 kg. £11 15s. kg.

Thioglycollate
- Ammonium 12s. 4d. to 16s. 4d. lb.
- Calcium:
  - 7-lb. lots 17s. 3d. ,,
  - 5-cwt. lots 14s. 3d. ,,

α-Tocopherol 25-g. lots 1s. 1d. g.

Vanillin 25s. 6d. to 30s. 6d. lb.

Zinc oxide B.P.
- 2-ton lots £110 10s. ton

GENERAL CHEMICALS

Acetic acid 1-ton lots dlvd.
- 80% Technical £99 ton
- 80% Pure £105 ,,
- Glacial B.P. £114 ,,
- 99-100% Glacial £111 ,,
- 98-100% Glacial £108 ,,

Acetic anhydride
1-ton lots dlvd. £128 ton
Acetone
5-gal. drums, free, non-returnable £128 ton
40 to 45-gal. drums, 10-ton lots £88 „
Alum, potassium granular crystals
50 kg. 1s. 2d. kg.
Aluminium hydroxide B.P.C. 34
28-lb. lots 2s. 4d. lb.
Aluminium stearate
(Precipitate) 1-ton lots £253 6s. ton
Ammonia
Persulphate £6 2s. 6d. cwt.
Phosphate: Mono- £106 ton
Di- £100 „
Amyl acetate
B.S.S. 10 tons and over £251 ton
Technical £249 „
Amyl alcohol
Technical in 1-ton lots £260 ton
Arsenic White powdered ex store £42 ton
n-Butyl acetate
10-ton lots £173 ton
n-Butyl alcohol
10-ton lots £149 ton
Calcium chloride
Solid 70 to 72%, 8-ton lots dlvd. £17 ton
Calcium oxide (Lime)
Ex marble 28-lb. lots 3s. 10d. lb.
Caustic soda
Solid 1-ton lots, from £39 0s. 6d. ton
Chloroform B.P. ½-ton lots 3s. 1½d. lb.
Chromic acid
Dlvd. U.K. (less 2½%) 2s. 0¼d. to 2s. 0¾d. lb.
DDT 3s. 0¼d. to 3s. 2d. lb.
2 : 4-Dichlorophenoxyacetic acid
99% pure, 1-cwt. bags £330 ton
Dimethyl sulphate 400 lb. drum lots 1s. 8d. lb.
Ether (Diethyl ether)
Tech. B.S.S. and Solvent B.P. 1-ton lots in drums 2s. lb.
Ethyl acetate 10-ton lots £145 ton
Ethyl alcohol
95% Gay Lussac 66·0 o.p.
2,500 to over 300,000 proof gallons per year in tank wagons 4s. 2¾d. to 4s. 0¼d. per proof gal.
Ferrous sulphate 50 kg. 1s. 4d. kg.
Formaldehyde
40% by volume dlvd. England 1-ton lots £38 15s. ton
Glycerin
1·2627 s.g. chem. pure, 5 tons and up, 5-cwt. drums £201 10s. ton
1·2627 s.g. technical grade, 5 tons and up, 5-cwt. drums £196 10s. ton
Hexamine
1-ton lots
Technical, bulk 1s. 8d. lb.
B.P.C. 1s. 11d. „
Hydrochloric acid
Commercial 18s. 6d. cwt.
Hydrogen peroxide
27·5% weight £119 ton
35% weight £143 „
Lactic acid (1-ton lots)
Pale tech. 44% by weight 1s. 3½d. lb.
Dark tech. 44% by weight 9½d. lb.
Magnesium chloride
Solid (ex wharf): 1-ton lots £17 10s. ton
Magnesium sulphate £14 10s. to £15 5s. ton
Mercurous chloride (calomel)
50 kg. 65s. kg.
Mercury sulphide, red
Ton lots and over 30s. 6d. lb.
Methylated spirits (Industrial)
Perfumery quality 500 gal. and upwards: gal.
61 o.p. 7s. 4d.
74 o.p. 7s. 11½d.
5 to 10 gal.:
61 o.p. 8s. 8d.
74 o.p. 9s. 3½d.
Methyl ethyl ketone
10 tons dlvd. in drums £143 ton
Methyl isobutyl carbinol
10 tons and up, in drums, dlvd. £163 ton
Methyl isobutyl ketone
10 to 50 tons, in drums, dlvd. £169 ton
Naphthalene
Crystal, dlvd., 4-ton lots, spot £65 4s. 3d. ton
Ball and flake (ditto) £73 14s. 3d. „
Nickel sulphate
dlvd. ton lots £189 ton
Nitric acid 70% intermediate £32 „
Pentachlorphenol
Flake, technical, 1-ton lots, dlvd. 2s. 2d. lb.
Phenol Crystals:
Under 1 ton dlvd. from 1s. 7d. lb.
10 tons and over dlvd. in returnable drums from 1s. 4½d. lb.
Phthalates
10-ton lots in drums
Diethyl (B.S.) £187 10s. ton
Dimethyl (B.S.) £179 ton
Potassium bromide
50 kg. 5s. 6d. kg.
12½ kg. 5s. 8d. „
Potassium carbonate
Calcined 96 to 98% (1-ton lots ex store) £76 ton
Hydrated (1-ton lots) £74 10s. „
Potassium fluoride
28-lb. lots 5s. 1d. lb.
Potassium sodium tartrate
5-cwt. lots £10 cwt.
Soda ash
1-ton lots dlvd., from £19 16s. 6d.
Sodium cyanide
96-98% £130 ton
Sodium hydroxide 28-lb. lots:
sticks (1-lb. bottles) 4s. 3d. lb.
pellets „ „ 3s. 9d. „
Sodium metal 28-lb. lots 3s. 8d. „
Sodium metasilicate
Dlvd. U.K. in ton lots £26 ton
Sodium phosphate
Dlvd. ton lots: Di-sodium, crystalline £40 10s. ton
Anhydrous £88 „
Tri-sodium, crystalline £39 „
Anhydrous £86 „
Sodium silicate
according to quantity, grade and delivery point
8-ton lots £13 10s. ton
1-ton lots £17 „
Sodium sulphate Ex works:
(Glauber salt) £13 ton
(Salt cake) unground, full truck loads £8 16s. 6d. ton
Sodium sulphide
Broken, returnable drums, dlvd. ton lots £37 2s. 6d. ton
Flake, ditto £38 12s. 6d. „
Solid ditto £36 2s. 6d. „
Sodium sulphite
Commercial crystals 4-ton lots £24 10s. „
(Dlvd. London in 1-cwt. single non-returnable bags)
Sodium tripolyphosphate
1-ton lots £95 ton
Stannic chloride 28-lb. lots 8s. 11d. lb.
Stannous chloride 28-lb. lots 9s. 5d. lb.
Strontium carbonate
96-98% 28-lb. lots 3s. lb.
Sulphuric acid, ex-works, according to quality and quantity
B.O.V. 78% from 8s. to 10s. cwt.
C.O.V. 96% from 11s. to 14s. cwt.
Zinc chloride
28-lb. lots sticks 6s. 9d. lb.

OILS AND FATS

Palm kernel oil
Refined, deodorised, 2-ton lots, naked, ex works £145 ton
Palm oil
Refined, deodorised, 2-ton lots, naked, ex works £102 ton
Stearine
dlvd. free bags
Pristerene 64 flake £148 ton
Pristerene 62 flake £133 „
Pristerene 61 flake £113 „
A premium of £2 ton is charged for powder and £4 for block

GUMS AND WAXES

Agar Agar No. 1
Kobe strip 10s. 3d. lb.
Powder 14s. „
Beeswax
Dar-es-Salaam spot (nominal) £26 10s. cwt.
Sudan spot (duty paid) £25 „
Bleached white (slab) £30 „
Refined yellow (slab) £27 10s. „
Benzoin
Sumatra spot £27 cwt.
Siam spot £2 7s. 6d. lb.
Candelilla Spot £23 10s. cwt.
Carnauba
Prime, Spot £48 cwt.
Fatty grey £29 „
Gum arabic Lump £7 5s. cwt.
Karaya Powder, Spot 3s. 6d. lb.
Paraffin wax
1-ton lots, acc. to grade £87 10s. to £120 ton
Peru balsam 10s. 9d. lb.
Shellac
No. 1 orange £13 cwt.
No. 2 orange £11 10s. „
Transparent white 4s. 3d. lb.
Pale dewaxed 6s. „
Tragacanth
No. 1 spot £127 10s. cwt.
No. 2 spot £121 „
Pale leaf £50 „
Amber £36 „
Brown to Red £27 „

NEW PATENTS

COMPLETE SPECIFICATIONS ACCEPTED

Pharmaceuticals

Process for the preparation of di-isobutyl ketone isovalerone. *Montecatini Soc. Générale per l'Industria Mineraria e Chimica.* 809,042.

Phenothiazine derivatives. *Soc. des Usines Chimiques Rhône-Poulenc.* 808,959.

Pyridazines and process for their manufacture. *Ciba Ltd.* 808,623.

L(−) and D(+) threo-β-(paranitrophenyl)-serine esters and a process for their manufacture. *Parke, Davis and Co.* 808,811.

Sulphanilamido - isoxazole derivatives and a process for the manufacture thereof. *Hoffmann-La Roche and Co. A.G.* 808,950.

Process for the preparation of substituted amino-carboxylic acid amides. *Bochme Fettchemie G.m.b.H.* 808,874.

Local anæsthetic compositions. *S. D. Goldberg.* 805,524.

Local anæsthetic composition and preparation thereof. *Cook-Waite Laboratories Inc.* 805,523.

Ointments and creams. *Soc. Parisienne d'Expansion Chimique S.P.E.C.I.A.* 806,719.

Manufacture of products of enzymatic oxidation. *Ciba Ltd.* 805,602.

Manufacture of pregnenals and derivatives thereof. *Ciba Ltd.* 805,601.

Pharmaceutical compositions. *Imperial Chemical Industries Ltd.* 809,165.

Manufacture of pyridoxine and its salts. *Vitamins Ltd.* 809,298.

Amines and processes for their preparation. *May and Baker Ltd.* 808,952; 809,023.

Piperazine compounds. *Wellcome Foundation Ltd.* 809,189.

Steroids

Synthesis of steroids. *Olin Mathieson Chemical Corporation.* 809,113; 809,114.

17 α-Hydroxy-steroids. *T. Reichstein.* 808,904.

Pest control chemicals

Stabilisation of acaricidal compositions. *Boots Pure Drug Co. Ltd.* 809,195.

Parasiticidal drugs. *National Research Development Corporation.* 809,295.

Detergents

Detergent compositions. *Hedley and Co. Ltd.* 808,668; 808,945; 809,060.

Aqueous detergent compositions. *Chemical Developments of Canada Ltd.* 808,805.

Antibiotics

Derivatives of cephalosporin N. *National Research Development Corporation.* 808,971.

Stable aqueous suspensions of tetracycline. *Pfizer and Co. Inc.* 809,015.

Dyestuffs

Monoazo dyestuffs of the benzene-azonaphthalene series. *Farbenfabriken Bayer A.G.* 806,938.

Process for the preparation of dyestuffs. *Farbenfabriken Bayer A.G.* 807,224.

Trisazo-dyestuffs containing an ortho¹-dioxy-azo grouping and complex metal compounds thereof and processes for their manufacture. *Ciba Ltd.* 807,575.

Cupriferous disazo-dyestuffs derived from diphenyl and process for their manufacture. *Ciba Ltd.* 808,063.

Chromium complexes of benzene monoazo pyrazolone dyestuffs. *Sandoz Ltd.* 807,695.

Black vat dyestuff of the violanthrone series. *General Aniline and Film Corp.* 807,595.

Disperse dyestuffs of the anthraquinone series. *Sandoz Ltd.* 807,591.

Production of azo dyestuffs devised from 2,3-hydrozynaphthoic acid. *Badische Anilin-und Soda-Fabrik A.G.* 806,721.

Cupriferous disazo-dyestuffs of the benzthiaxole series. *Ciba Ltd.* 806,050.

Fertilisers

Fertilizers. *Fisons Ltd.* 807,107.

Manufacture of ammonium sulphate. *Simon-Carves Ltd.* 805,471.

Micronutrient-containing fertilisers and soil-improving agents. *Osterreichische Stickstoffwerke A.G.* 805,775.

Miscellaneous

Proteolytic enzyme. *American Cyanamid Co.* 804,608.

Dentifrice composition containing stannous tin compounds. *T. Hedley and Co. Ltd.* 804, 486.

Manufacture of phenols. *Distillers Co. Ltd.* 805,048.

NEW TRADE MARKS

APPLICATIONS

Pharmaceuticals

SYLPHANA.—770,415. *G. Taylor.*

ALCOPAR.—776,817. *The Wellcome Foundation Ltd.*

KOFFEE-LIFTS.—B776,831. *Medopharma Ltd.*

KATAPHOS.—779,364. *Dr. A. Wander S.A.*

ALIEVERGEN.—781,054. *Imperial Chemical Industries Ltd.*

AGNULIN.—781,206. *Glaxo Laboratories Ltd.*

BARBONESIN.—775,282. *British Drug Houses Ltd.*

NO-SIREE.—775,768. *Airkem Ltd.*

HYRUBAN.—776,160. *Boots Pure Drug Co.*

Cosmetics, toilet preparations

FLAMBEAU.—759,056. *Fabergé Inc.*

AROMEX. — 778,105. *A. Boake, Roberts and Co. Ltd.*

DRYDEX.—778,106. *A. Boake, Roberts and Co. Ltd.*

BRONZONE.—778,689. *Boots Pure Drug Co. Ltd.*

PETAL TOUCH.—B771,910. *R. H. Mascall.*

LA GRANDE FOLIE.—779,076. *Warner Harvey and Co. Ltd.*

LANOVIT.—779,365. *Dae Health Laboratories Ltd.*

SWANDOWN PUFF AND GLO.—770,612. *Henry Tetlow Co. Ltd.*

SWANDOWN CONSTANT COLOR.—776,036. *Henry Tetlow Co. Ltd.*

SWANDOWN PRETTI-QUIK MAKE UP.—776,038. *Henry Tetlow Co. Ltd.*

DENDRON.—777,663. *Dendron Distributors Ltd.*

ORÉAL.—777,757. *Société Monsavon-L'Oreal.*

IMPERIAL LEATHER. — 778,110. *Cusson Sons and Co. Ltd.*

Sixty-Five Years Ago

From MANUFACTURING CHEMIST

February 1894

Protective "muzzle"

The Home Secretary is still receiving reports from his committee on dangerous employments. The last report issued recently suggests certain rules for those engaged in the chemical works. The dangers to be guarded against in some departments are most vividly described. For example, in the bleaching powder department of a certain alkali works, the packers have to work with a muzzle to protect themselves from the chlorine gas given off by the powder. The muzzle consists of about 30 folds of flannel, damped and tied tightly over the mouth, with the nostrils free and resting on it. The men are obliged to inhale through the muzzle, and exhale by means of the nostrils, otherwise they would be "gassed."

Manufacturing Chemist's **ENQUIRY BUREAU**

Leonard Hill House, Eden Street, London N.W.1.

Subscribers requiring names of suppliers of chemicals or plant should state their needs on this form, giving approximate quantities, clip it to their business noteheading and send it to the Bureau, as above. Please type or use block letters.

_____

_____

_____

_____

_____

For office use. *No.* *Date.*

Reed now produce both solid and corrugated cases under the trade name Reedac

Reed now produce both solid and corrugated fibreboard cases—which means that for the very first time, whatever type of case you employ, you can get it from Reed.

Use Reedac cases—either solid or corrugated—and you're getting **(1)** the utmost economy on a related quality/price basis; and **(2)** the best possible protection for your products.

Your regular copy of "CASE"

The R.C.C. Magazine "Case" contains advance news of modern packaging techniques.

Reserve your regular copy NOW!

Name .....

Company .....

Address .....

.....

(PLEASE WRITE IN BLOCK CAPITALS) I/R

Reed PAPER GROUP

REED CORRUGATED CASES LIMITED

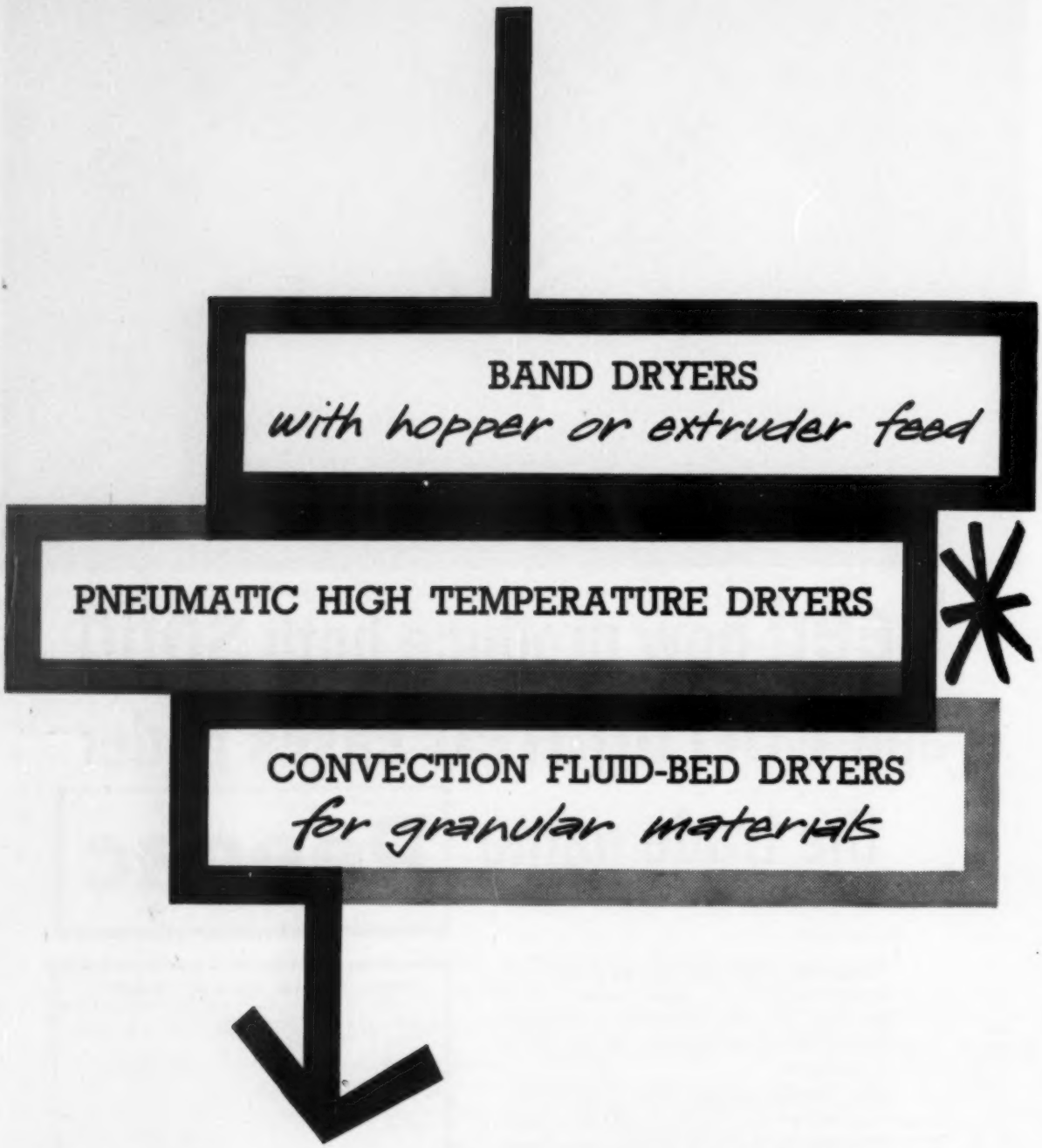
GREAT WEST ROAD · BRENTFORD · MIDDLESEX

Telephone: EALing 4555

BIRMINGHAM · CAMBRIDGE · EDINBURGH · GLOUCESTER · MANCHESTER · WIGAN

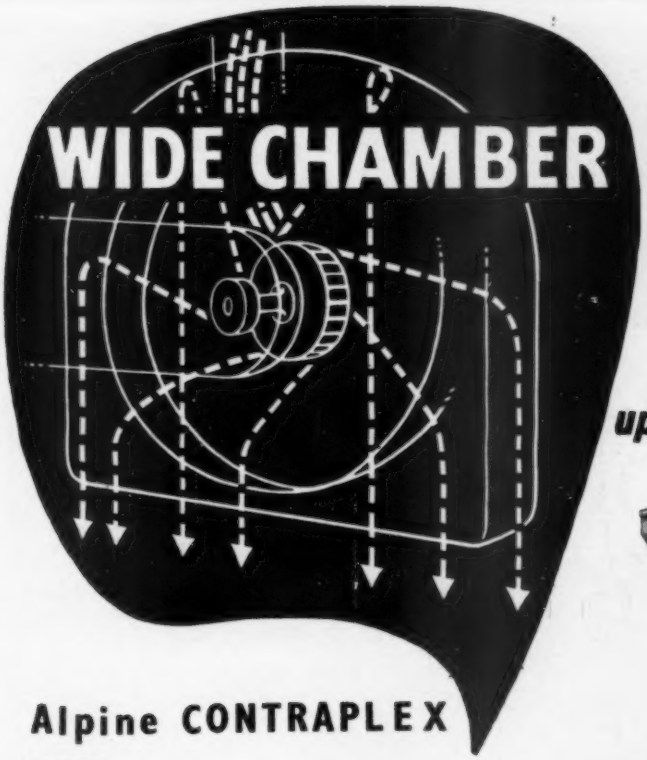
NEW HYTHE & TOVIL (Maidstone) · THATCHAM · WARRENPOINT (N. Ireland)

RCC1C



Petrie & McNaught Ltd

✱ CRAWFORD STREET · ROCHDALE · LANCS



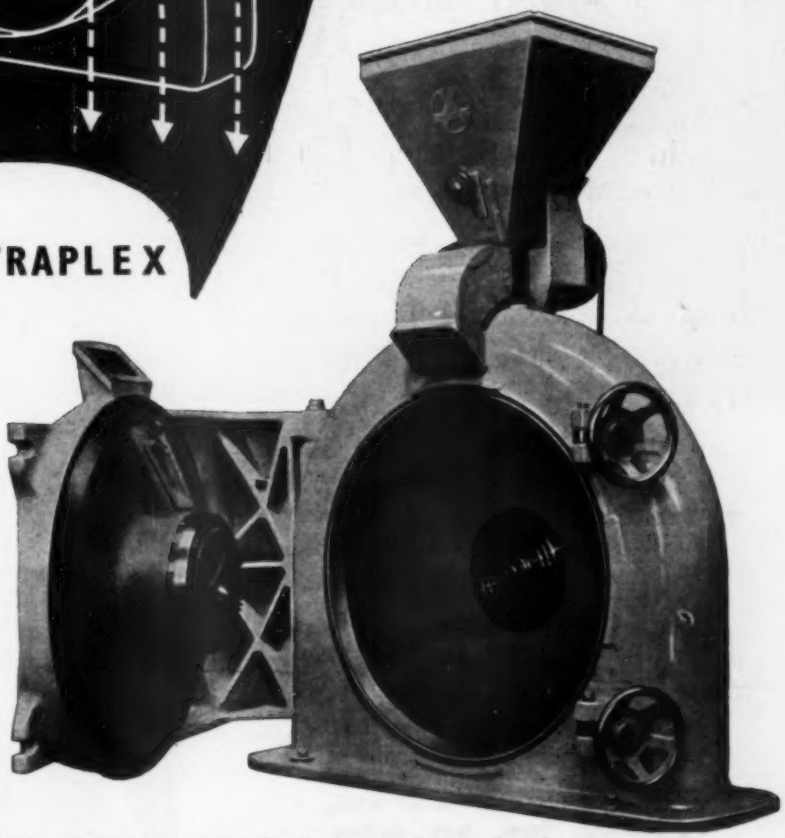
WIDE CHAMBER MILL for Fine Grinding

with impact speeds up to 210 yds per second

Alpine CONTRAPLEX

WIDE
CHAMBER
MILL

The contra-rotating discs at speeds up to 12,000 r.p.m. give impacts at relative speeds of up to 210 yds. per second, breaking the material into the finest particles. A free flow of material is maintained and build-up of fine particles on the chamber walls is prevented. Variable speeds and different pin formations permit a wide range of application. Additional air can be introduced for cooling or drying.



ALPINE PLANT is now widely used in this country for the improved processing of materials, and includes: KOLLOPLEX high speed sieveless grinder for fine and ultra-fine pulverising; AIR CLASSIFIERS AND SEPARATORS for use in conjunction with grinders or as separate units.

Made by ALPINE A. G., Augsburg, and distributed in the U.K. by

LAVINO (LONDON) LIMITED

GARRARD HOUSE, 31-45 GRESHAM ST., LONDON EC.2 Tel: MONarch 6137

Which Package is Selling Your Product?

The Bag on the right of the illustration was sealed by the unique "STICLA" versatile high-speed adhesive bag-sealer

← *the "STICLA" adhesive method for profit-happy packaging.*

WILL SEAL
POLYTHENE BAGS
CELLULOSE FILM BAGS
MULTIWALL PAPER BAGS

Entirely British made and designed
British and Foreign patents pending

5 REASONS WHY THE

STICLA SEALER

PAYS FOR ITSELF in a SHORT TIME!

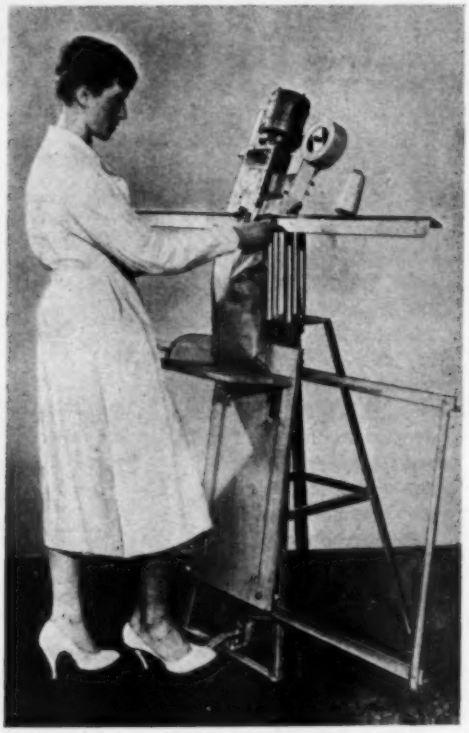
(1) **Saves container material, reducing costs, eliminating bunching.**

(2) **Seals *any* weight and size polythene film bags or paper bags to a maximum length of 40″ when filled.**

(3) **"Sticla" produces a *hermetically sealed* container, stronger than the surrounding material.**

(4) **Rip cord goes through seal, pull one end, bag opens,**

(5) **"Sticla" made of sturdy steel, economical to run.**



SOLE DISTRIBUTORS

THE THAMES SACK & BAG CO. LTD.

PACKAGING MACHINERY DIVISION

28 CITY ROAD, LONDON, E.C.1 TEL.: MONarch 7387/8

THE SHAPES VARY.....

Tablets have so many obvious advantages that more and more people are using them.

Tablets are so convenient—you can be certain of accuracy, uniformity, and there is no waste. Size, shape and weight vary depending on need.

Catalysts, Plastics, Desiccants, p-Dichlorobenzene blocks, Fertilisers, Pharmaceuticals, Food Products, etc. etc. Tablets for Kjeldahl Determinations and other standardised techniques.

There are hundreds of different shapes and sizes—in thousands or millions, pounds or tons.
We will gladly advise whether a satisfactory tablet can be made—and prove it.

USES VARY TOO

THOMPSON & CAPPER LTD.

MANUFACTURING CHEMISTS

SPEKE, LIVERPOOL

Telephone: Hunts Cross 1321

FIRE AND SAFETY EQUIPMENT FOR FACTORY ACT REQUIREMENTS

A complete range of Fire Extinguishers, Hydrants, Alarms, Rescue Apparatus, Fire Hose Reels, etc., to meet all types of fire risks.

Fire Extinguisher and equipment serviced throughout Britain by experienced engineers at a cost of less than 6d. per month per extinguisher.

FREE SERVICE AND ADVICE FOR ALL TYPES OF FIRE RISKS AND PREMISES. WE OFFER COMPLETE FIRE PROTECTION

Ask our representative to call without obligation and write for our 28-page Catalogue for a comprehensive range of equipment manufactured to B.S.I. Specification.

READ & CAMPBELL

LIMITED (Est. 1878)

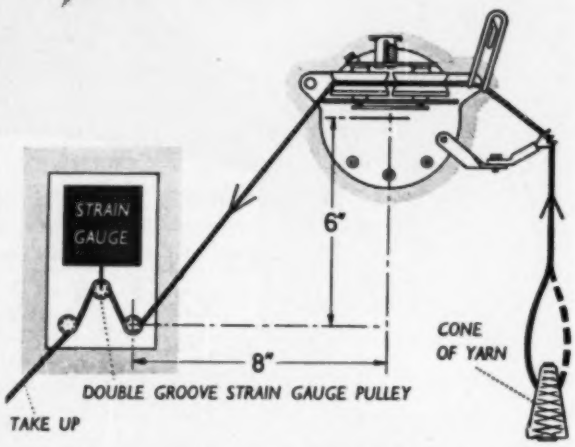
Fire Protection Engineers

HEAD OFFICE (DEPT. M.C.)
75, VICTORIA STREET, LONDON, S.W.1
Tel.: ABBey 2602|5762

And at Birmingham, Glasgow, Manchester, Swansea, etc.

THE INSIDE STORY

5 measuring yarn friction



The performance of any type of textile finish depends, to a greater or lesser extent, upon how the presence of the finish affects yarn-to-yarn and yarn-to-metal frictional characteristics during mill processing.

The preliminary screening of finishes on the basis of laboratory friction measurements can provide much useful information before expensive mill trials are undertaken, and our American associates, the Atlas Powder Company, have recently developed two pieces of equipment for such work.

The apparatus shown in diagrammatic form above is designed for the measurement of yarn-to-metal friction, and a modified form of this is employed for yarn-to-yarn measurements. In both cases the drag set up in the test yarn when passing through the equipment, where yarn/metal or yarn/yarn friction is set up, is transmitted to a strain gauge and ultimately amplified and recorded on an oscillograph chart.

A technical bulletin giving full details of both pieces of equipment, test procedures, etc. is available, and we shall be pleased to send you a copy of this, together with information concerning the various Honeywill-Atlas products which have proved their value as textile finishes.

Honeywill Atlas LIMITED

If you have any query relating to textile finishing agents do not hesitate to contact our technical Service Department, whose experience in solving problems of this nature is unrivalled. Write to the sole selling agents:

HONEYWILL & STEIN LTD
Devonshire House, Piccadilly, London W.1
Telephone: Mayfair 8867

Q.V.F. GLASS SPHERICAL VESSELS

5 - 2 0 0 LITRES

in many PROCESSES, in many INDUSTRIES

WE CAN SUPPLY NECKS IN ANY REQUIRED POSITION

Spherical Vessels are used as reboilers and receivers in distillation units.

Every vessel is suitable for use under full vacuum conditions.

In processes where purity of product is essential, Q.V.F. Spherical Vessels are a 'must'.

Write for full details.

Q·V·F·

LIMITED

The Chemical Engineers in Glass

DUKE STREET · FENTON
STOKE-ON-TRENT · STAFFORDSHIRE

Tel: Longton, Staffs 32104-8.
Grams: Glassplant, Staffs.

Pharmaceutical

ZINC OXIDE

Supplied by us to Manufacturing Chemists for nearly 100 years

Samples and prices from

MORRIS ASHBY LTD

Head Office: 10 PHILPOT LANE, LONDON, E.C.3

and at

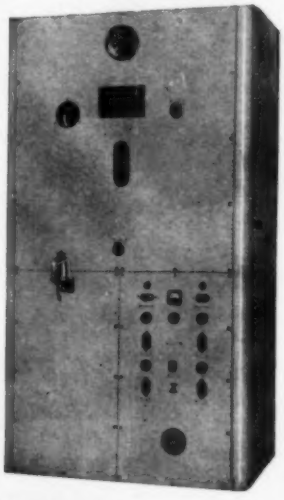
Birmingham, Bristol, York, Hull, Glasgow and Liverpool

Sole Distributors for

THE AMALGAMATED OXIDES (1939) LTD. DARTFORD, ENGLAND

'MASCARINI'

THERMOCOMPRESSOR SUPER-STILL



★ *High Thermal Efficiency.*

★ *Low Power Consumption— Yield: 4-11 gals. per kWh.*

★ *Safe, Reliable, and Simple in Operation.*

★ *Negligible Maintenance.*

★ *Models available: 10, 20, 30, 60, 100, 150, 300 litres & upwards, per hour.*

for

Chemically pure Sterile, Apyrogenic Distilled Water

Sole Distributors:

MASON & MORTON LTD.

MURRAY HOUSE, VANDON STREET, LONDON, S.W.1. Telephone: ABBEY 6746/8

For that new building....

CONTACT ATCOST LIMITED

—Britain's foremost manufacturers and erectors of

PRECAST REINFORCED CONCRETE BUILDINGS

***ATCOST-BUILT** factories, warehouses, transport-sheds, workshops, canteens, etc. are of the highest quality, yet competitively priced. They are fire-resistant, easily-extendible and require no painting or maintenance. For free, 24-page illustrated brochure, and details of our comprehensive service, complete and post this coupon now!*

NAME OF FIRM.....

ADDRESS.....

.....

(Please state Ref.:) .....

MC.

ATCOST LTD., *Industrial Division,*
THE PANTILES, TUNBRIDGE WELLS, KENT
Tunbridge Wells 3411 (5 lines)

PRIVATE & CONFIDENTIAL

APART FROM OUR STOCK PRODUCTION LINES OF NICOTINATES, VITAMIN "K" ANALOGUES, CITRATES, 8 HYDROXYQUINOLINE AND ITS DERIVATIVES, ETC. WE MANUFACTURE A NUMBER OF SPECIAL LINES FOR INDIVIDUAL CUSTOMERS, WHICH WE DO NOT OFFER ON THE OPEN MARKET.

If you want a speciality made, why not write in confidence to

R.F.REED LTD

TRADE MARK KEMISCALE

HERTFORD ROAD · BARKING · ESSEX

Telephone: Rippleway 2224 *Telegrams: Kemiscale Barking*

FINE CHEMICALS manufactured to the HIGHEST STANDARD

GLASS ENAMEL LINED EQUIPMENT

★

A Complete Plant or a Single Unit. Designed to meet your own requirements, and lined with a Hard Glass Enamel developed during over a century of service to the chemical industry.

★

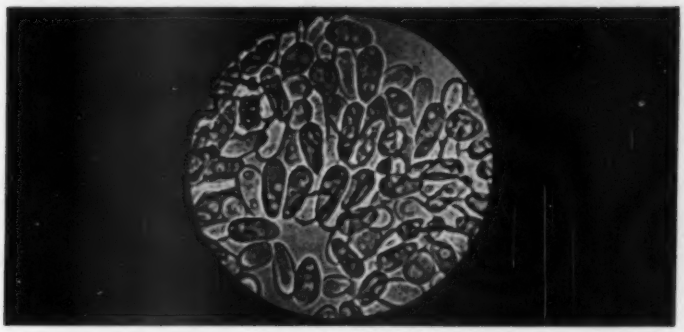
T. & C. CLARK & Co. LTD.

WOLVERHAMPTON

Established 1793

Grams: Clark, Wolverhampton

Telephone 20204/5



Photomicrograph by the Distillers Company Limited

K_F = *filtration constant*

Results are scientific if they can be reproduced.

The FORD system of grading filtration media removes one variable from your calculations. Each time you employ a specific grade of sterilising, deodorising, decolorising, depyrogenating, or ordinary filtration material from FORD's, you can be sure that its performance will be exactly the same as any previous batch of FORD material of the same grade. Please write, stating your occupational interest. You will receive literature and samples that explain the FORD system of grading filtration media, and the rigid standards imposed during manufacture.

FORD 428 MILL

REGISTERED TRADE MARK

...quality control by efficient filtration

T. B. Ford Ltd., 30 New Bridge Street, London, E.C.4. Phone: CITy 2272

P.C.O.C. Parachlor-ortho-cresol

For many years we have been large-scale manufacturers of this widely-used intermediate for which we should be pleased to receive your enquiries and to submit samples at your request.

In addition we should like to draw your attention to the undermentioned selection from our production of fine chemicals.

D.D.T. (and certain formulations)	Dichlorphenol	M.B.T.
Terpineol	P.C.M.X.	M.B.T.S.
D.C.M.X.	Chloral Hydrate B.P.	Benzylated-Cresylic-Acid
H.R.W.	Terpinolene	Chloral Anhydrous

The finest of the fine from:

COCKER CHEMICAL CO. LTD. (Dept. SX.)

OSWALDTWISTLE · LANCASHIRE

Tel.: Accrington 3621-3

Alginates

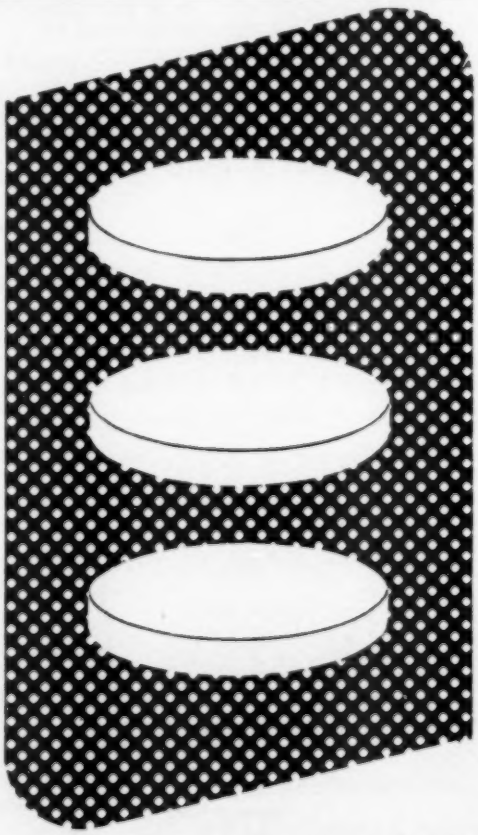
IN TABLET MANUFACTURE

ALGINIC ACID is an excellent tablet disintegrant: even "difficult" medicaments give tablets which disintegrate rapidly and smoothly. In the manufacturing process alginic acid is easily incorporated by moist granulation; dust separation and capping are greatly reduced.

And for those who require a neutral disintegrant there is

ALGINATE P.572

a new product combining the technical advantages of alginic acid with neutral pH.

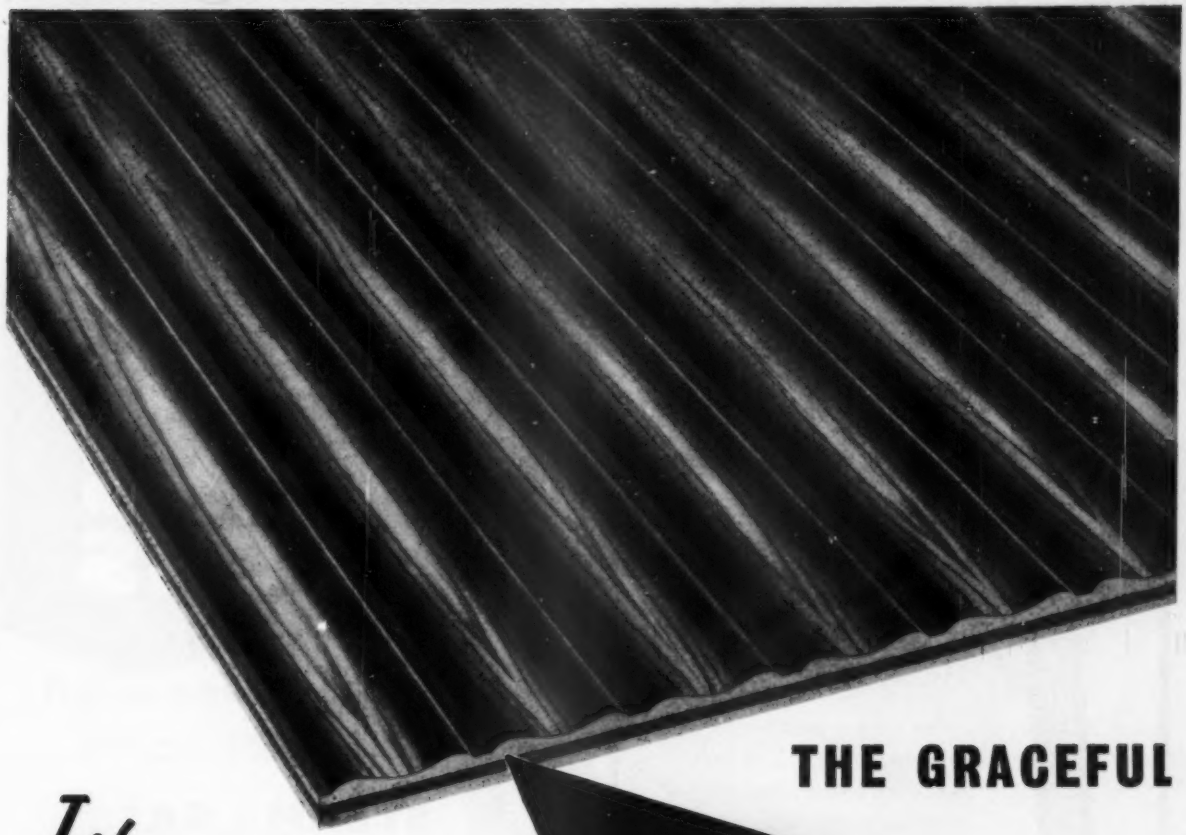


For test samples and technical literature, write to:

ALGINATE INDUSTRIES LIMITED

Walter House · Bedford Street · Strand · London W.C.2

Telephone: Temple Bar 0451



It's NEW!

THE GRACEFUL

Profilco

PANELLING

The PROFILCO panelling is a Plywood made from three layers of 2.5 mm. Utile Mahogany veneers. Bonding A-70 and AX-100. The face veneer has a most attractive profiling and the edges of the boards have been moulded in such a way that, when joined together, the joints cannot be noticed.

The PROFILCO boards are carefully sorted in order to attain a uniform appearance.

A natural oil finish or cellulose lacquer finish is recommended.

Samples and prices on application

Thickness: 5/16"

Standard Sizes:

A-70 Bonding

5′ x 2′ 6′ x 2′ 7′ x 2′ 8′ x 2′

AX-100 Bonding 8′ x 2′

Packed 15 boards to a bundle

C. F. ANDERSON & SON LTD.

TIMBER AND PLYWOOD IMPORTERS

ISLINGTON · LONDON · N.1. Tel: CANonbury 1212 (28 lines) All Depts.

CITRATES?

Morsons will know!

When you have specialised for over a century, you may fairly claim to know your subject. And that is precisely our position today. For more than a hundred years, Morsons have been making chemicals for industry and the pharmacist; and this long experience has resulted in the technical supremacy which is self-evident in every Morson product.

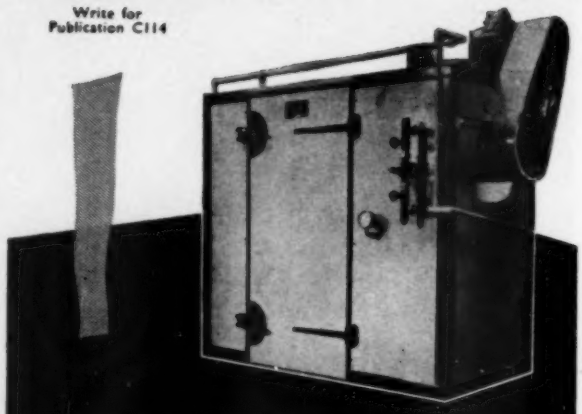
POTASSIUM CITRATE B.P.

SODIUM CITRATE B.P.

If you have a chemical problem, Morsons are at all times glad to place their knowledge and technical resources at your disposal.

THOMAS MORSON & SON LTD.
Ponders End, Middlesex

Write for Publication C114



DRYING OVENS

HEATING MEDIUM

STEAM • GAS ELECTRICITY

. . . robustly constructed on sound engineering principles . . . yet another reason why so many firms in every industry rely on Briggs of Burton for their Drying Ovens

BRIGGS OF BURTON

S • BRIGGS & CO • LTD
BURTON-ON-TRENT

how much have you grown since 1921?

In nearly four decades quite a lot has happened. Industry in all fields has grown apace and those who have faced the challenge of changing conditions and guided their activities accordingly have grown immeasurably in experience.

That is why it is worth recalling that in 1921 LaBour marketed the first practical self-priming pumps. These pumps were destined to serve almost every industry in all parts of the world.

LABOUR

During those 37 years, experience has given LaBour an unsurpassed knowledge of design, metallurgy and operation. It is no idle boast therefore that today LaBour pumps, in spite of many imitators, are unchallenged for dependable service and efficiency.

BRITISH LABOUR PUMP CO. LTD. BLUNDELL STREET, LONDON, N.7

Telephone: NORTH 6801-5
Cables: LABOURPUMP LONDON

P 1060

"... one for the lost 'profity' office?"

Are you aware (Tim Tapir says)
That packages of every size
On rail or road or waterways
Are seen by countless pairs of eyes.

That precious space your package bears
Can quickly make your profit rise—
Use 'Transoprint' to seal your wares
You'll find it pays to advertise!

TRANSOPRINT

SELF-ADHESIVE PRINTED TAPE

and now—UNDER-SURFACE PRINTING

Colourful-Attractive

5-STAR TRANSOPRINT

Gosheron 50 YEARS *leadership in tape technology*

JOHN GOSHERON & CO. LTD.

The Packaging and Industrial Tape Centre (Regd.) 79-81, Albert Embankment, London, S.E.11 *Telephone:* RELiance 7600

FANS FOR CORROSIVE GAS

- ★ **Designed specially for corrosive fumes**
- ★ **No rubbing or bearing surfaces**
- ★ **No gas leakage**
- ★ **Homogeneous, fully corrosion-resistant materials used throughout.** *Write for leaflet 283*

The handling of Corrosive liquids and gases is but one facet of Kestner's activities. Complete process plants are supplied for the production of chemicals, foodstuffs, etc. *Write for Leaflet No. 282A*

24" Keebush Axial Flow Fan

Kestner THE CHEMICAL ENGINEERS

KESTNER EVAPORATOR & ENGINEERING CO. LTD.

5 GROSVENOR GARDENS · LONDON · S.W.1

BUSH
for
Organic Chemicals
ANISALDEHYDE
BENZOPHENONE
PROPIOPHENONE
SALICYLALDEHYDE
W. J. BUSH & CO. LTD . LONDON . E.8 . ENGLAND
Telephone: CLissold 1234

GLAXO LABORATORIES

Leading producers of VITAMIN B12

OFFER

PURE CRYSTALLINE SUBSTANCE

B_{12} TRITURATES

B_{12} SOLIDS

FOR ALL PHARMACEUTICAL PURPOSES

Pure—stable—high biological activity * *Produced by streptomyces griseus fermentation*

BULK SALES DEPARTMENT, GLAXO LABORATORIES LTD., GREENFORD, MIDDLESEX. BYRon 3434

Subsidiary Companies or Agents in most countries

WHY NOT SAVE substantially on your capsule costs and still retain the high quality in keeping with the standard of your product.

This is possible only by using Adhesive Overseals by Ideal available plain or decorated to match your labels.

We are pioneers of 22 years standing both in capsules and labour-saving capsuling machines.

right on top with Alu-pharm ALUMINIUM Overseals

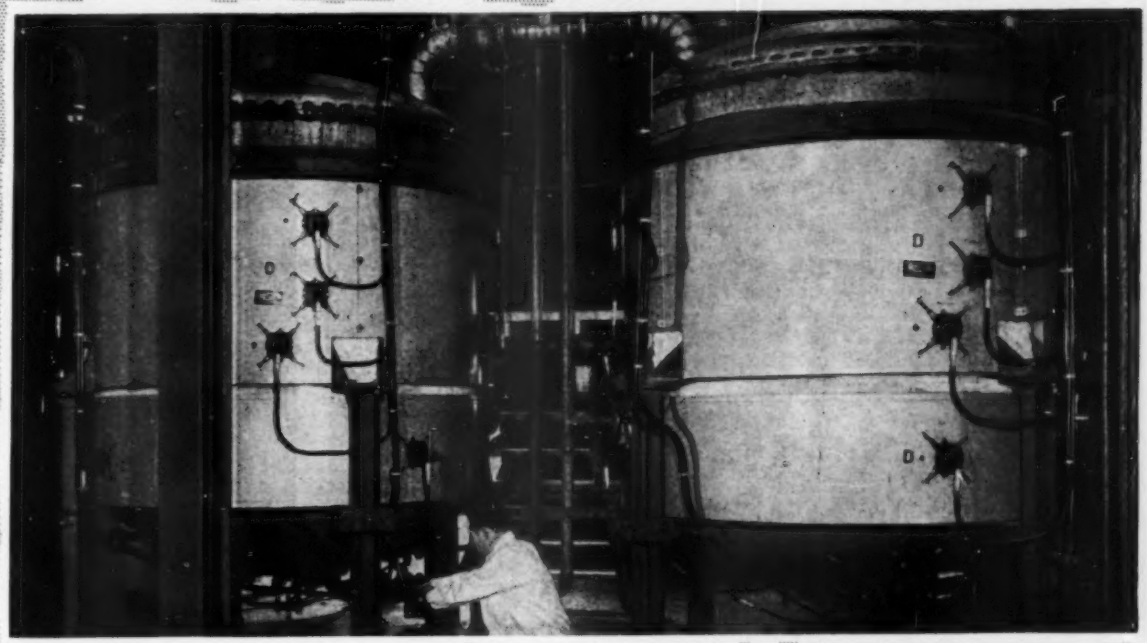
IDEAL CAPSULES LTD

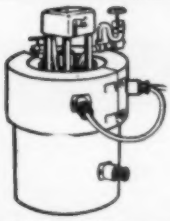
EDINBURGH AVENUE · SLOUGH · BUCKS

Telephone: Slough 22251 (5 lines) Telegrams: Iseal, Slough

ISOMANTLES *for large plant...*

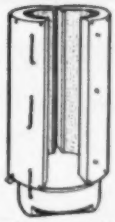
and other uses



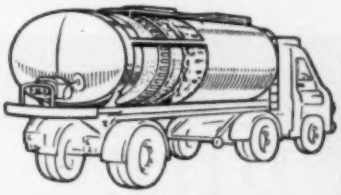


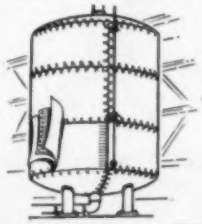
ISOMANTLE for Autoclave.

ISOJACKET for Cylindrical Vessels.

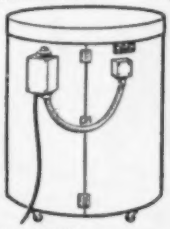


Road Tanker heated by ISOPANELS.





Flexible ISOPANELS maintain correct temperatures of storage tanks.



ISODRUM heater for efficient handling of viscous materials.

ISOTAPE electric heating tape for fuel oil and innumerable other applications.

For Flameproof Areas: Illustration at the top shows 2 flameproof ISOMANTLES on 1,000 gal. vessels.

Today there is hardly a surface heating problem that cannot be solved by ISOPAD Equipment, either resistance or M.F. induction.

Send for 44-page Catalogue (Plt) and let us help you solve your heating problems.

Visit our Stand No. 8 at the O.C.C.A. Exhibition, Royal Horticultural New Hall, London, S.W.1. 17th—19th March 1959.

ISOPAD LTD ELECTRIC SURFACE HEATERS

Phone: ELStree 2817/9 **ISOPAD LTD.** **BARNET BY-PASS, BOREHAM WOOD, HERTS**

B. NEWTON MAINE LTD

LLOYDS BANK BLDG

LETCHWORTH 2140

LETCHWORTH

for

RARE CHEMICALS

with special emphasis on substances produced by

HIGH PRESSURE HYDROGENATION

P.H.C.

WAX

BEE-HIVE TRADE MARK REGD. FOR CERESINE WAX

BEESWAX B.P., White and Yellow. Also Compositions.

SPERMACETI, Finest Snow White.

CARNAUBA WAX, Fatty Grey, Yellow, Bleached and Residues, various grades.

CANDELILLA WAX, FIBRE WAX. MICRO CRYSTALLINE WAX, etc,

MONTAN WAX, Crude and Bleached.

EST. 1870

POTH, HILLE & CO., LTD.

HIGH STREET, STRATFORD, LONDON, E.15

PHONE: MARYLAND 7091

GRAMS: POTHASKA, LONDON, E.15

WORKS: HUNT'S LANE, BOW BRIDGE, STRATFORD, E.15.

OZOKERITE, White, Natural, Yellow and Crude.

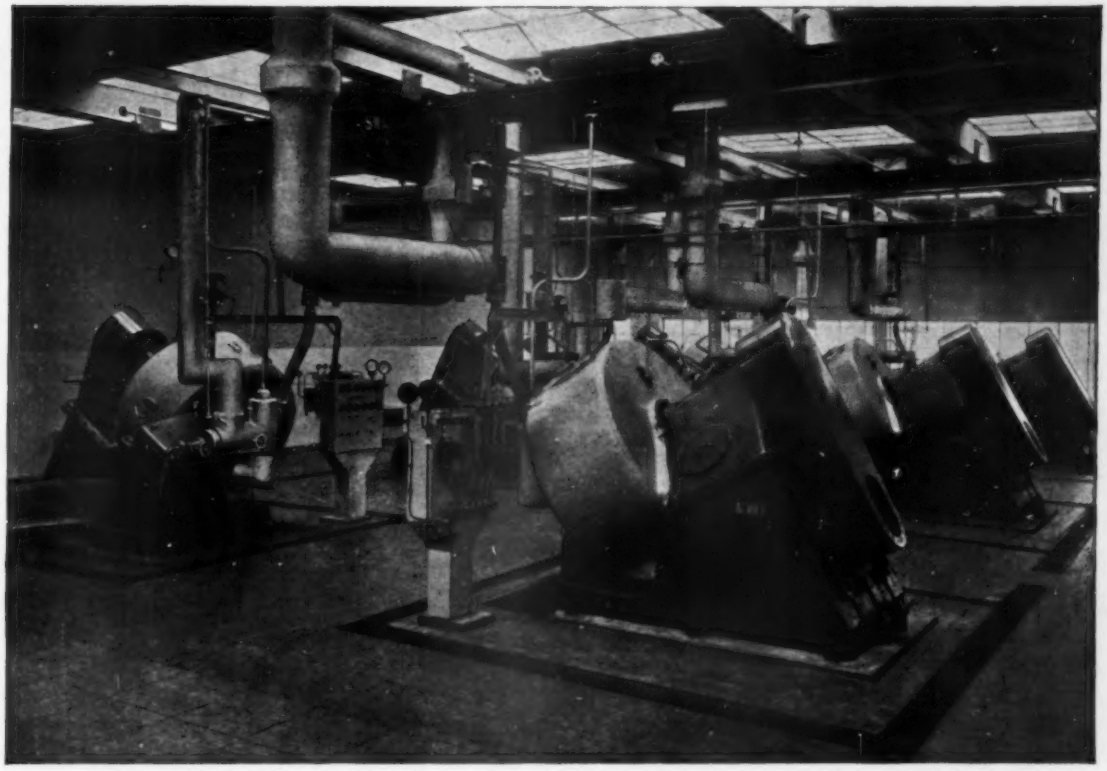
CERESINE WAX, all grades and colours.

PARAFFIN WAX, all Melting Points.

POLISH WAXES, for Car, Shoe, Floor and Furniture Polish Makers.

CABLE WAXES, for saturating and Finishing. All grades and colours.

A difficult duty to perform . . . .

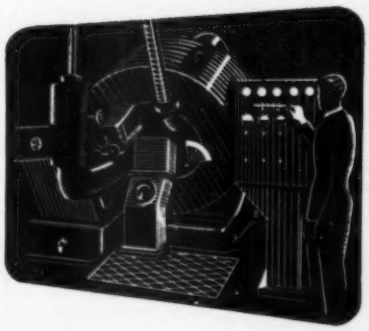


Successful chemical processing is not an accident—it results from patient and carefully planned research and calls for exceptionally skilled manufacturing techniques.

BROADBENT CENTRIFUGALS are called in to perform many difficult duties in modern chemical processing and it is significant that the problem of producing paraxylene, one of the basic constituents of "TERYLENE," is entrusted to them at the famous Wilton Works of Imperial Chemical Industries.

Conditions are far from easy, and the necessary materials are handled at extremely low temperatures with explosion risks.

We have the answer to your centrifuging problems.



BROADBENT CENTRIFUGALS

THOMAS BROADBENT & SONS LTD • HUDDERSFIELD

Phone: 5520/5 *Grams:* 'BROADBENT' Huddersfield.

BY APPOINTMENT TO HER MAJESTY THE QUEEN
Suppliers of Fire Extinguishers The Pyrene Company Limited

making the chemical world safer from fire

The many and varied fire dangers that are ever present in the chemical industries call for nothing less than the finest methods of fire protection. In this field the highly developed and specialized Fire Detecting and Extinguishing Systems supplied by The Pyrene Company have a record and reputation second to none throughout the world. Whatever fire problems you have in your works . . . laboratories . . . processing plant . . . stores or office buildings . . . "Pyrene" Fire Protection provides the right answers.

Write for full details or instruct us to send a Technical Representative to give you expert advice without charge or obligation.

Pyrene TRADE MARK FIRE PROTECTION

THE PYRENE COMPANY LTD

(*Dept. M.C. 2*) 9 GROSVENOR GARDENS · LONDON, S.W.1
Tel.: VICTORIA 3401 *Head Office & Works:* BRENTFORD · MIDDX
Canadian Plant: TORONTO

BASES
for
DENTIFRICES
COSMETICS
LIQUID POWDERS
etc.

Manufacturers of the above products are invited to submit particulars of their requirements.

Many world-famous products of the highest grade are compounded with one or more of our four specially prepared bases:

STOCKALITE
DEVOLITE
SPESWHITE
AND
SUPREME

Highly recommended as **substitutes for Foreign Materials** hitherto imported for the purpose.

Unequalled for Smoothness, Fineness, Purity and Whiteness.

•

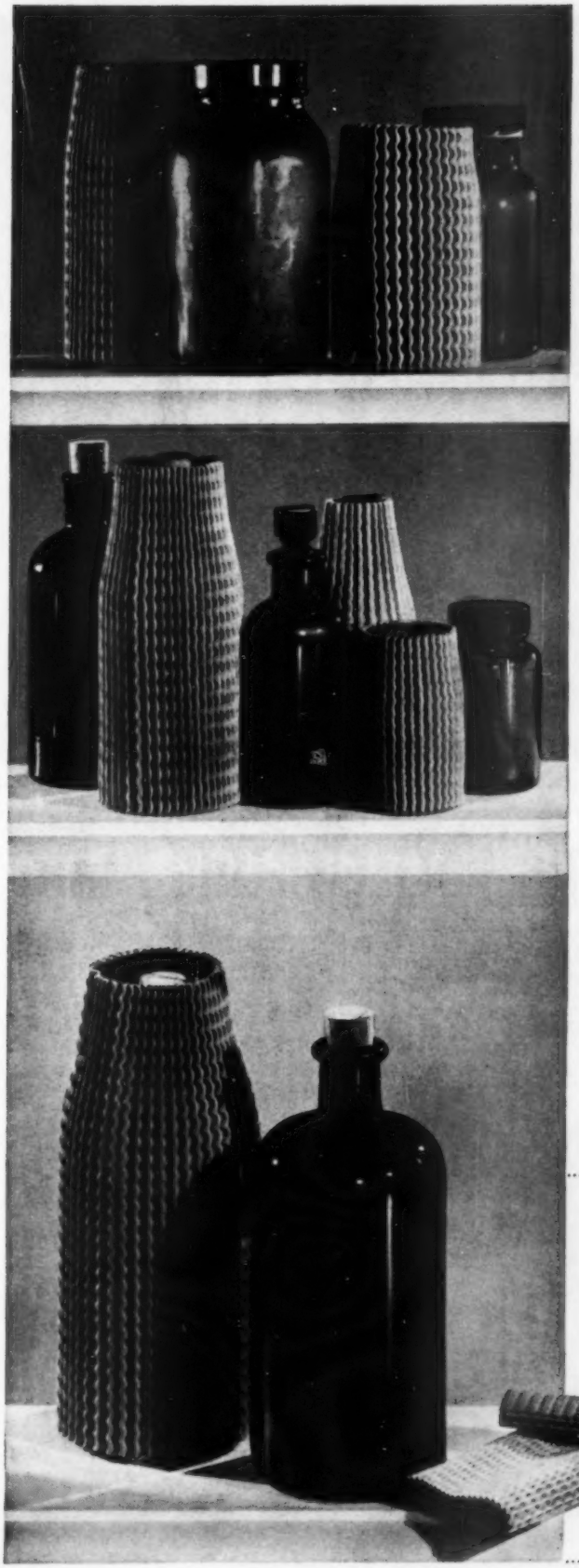
ENGLISH CLAYS, LOVERING POCHIN & COMPANY LTD.
ST. AUSTELL, CORNWALL

LONDON
10 Lower Grosvenor Place, S.W.1
Telephone: Tate Gallery 9346/8

MANCHESTER
32 Oxford Street, Manchester, 1

EDINBURGH
2 St. Andrew Square

LEOMINSTER
15 Church Street



Spicers CARBION *could help you to solve YOUR packaging problems*

Manufactured by a patented process, CARBION is an "elasticised" paper which forms an attractive protective packaging sleeving with remarkable properties of cushioning, crush-resistance and recovery.

Ready-made Carbion sleeves of the required dimension and length (packed flat for storage) can be rapidly slipped over glass bottles, jars, ampoules or stoneware and adjust themselves elastically to the shape of the protected articles to form a snugly-secure cover.

The use of Carbion protective sleeves saves labour and materials and the sleeves are readily removable and disposed of when the product is taken into use.

The Carbion process also produces rigid case linings and dividers as well as materials combining the functional with the decorative—in a variety of colours and finishes.

We will willingly arrange for a supply of appropriate sized CARBION sleeves to be sent to you so that you can make a controlled test.

Post to
SPICERS CARBION FACTORY · LANGSTON ROAD LOUGHTON · ESSEX · TELEPHONE LOUGHTON 3638

Please arrange to supply (details/samples) of Carbion sleeving

NAME OF FIRM .....

FOR THE ATTENTION OF .....

ADDRESS .....

.....

.....

.....

vnw/r21

MAGNESIUM TRISILICATE
ALUMINIUM GLYCINATE
(DIHYDROXY ALUMINIUM AMINOACETATE)
ALUMINIUM ISOPROPOXIDE
TRICHLOROACETIC ACID

Write for samples and prices:

KAYLENE (CHEMICALS) LIMITED
WATERLOO ROAD, LONDON, N.W.2
TELEPHONE: GLADSTONE 1071/2/3 TELEGRAMS: KAYLOIDOL, CRICKLE, LONDON

HIGH-SPEED AUTOMATIC BOTTLE FILLING PLANT

THE ROBERTS "STRAITLINE"

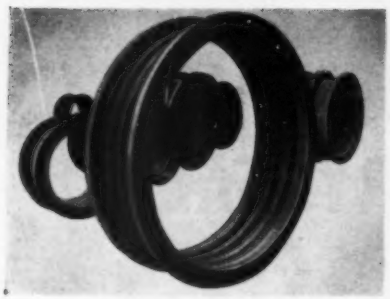
MULTIPLE HEAD VACUUM FILLING MACHINE

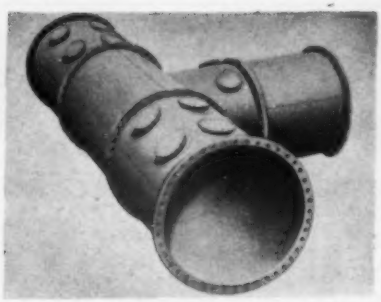
Nº 714

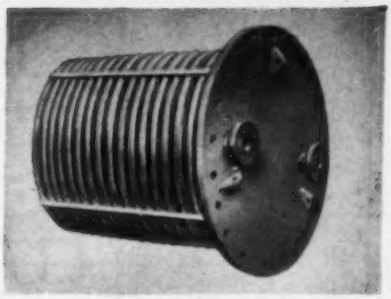
ALL RIGHTS RESERVED

- FITS CONTINUOUS PROCESS LAYOUTS
- VARIABLE SPEED AND BOTTLE SIZES
- ALTERNATIVE VACUUM OR VACUUM PLUS GRAVITY FILLING AS INITIALLY REQUIRED
- EASY CLEANING—CLEAN FILLING—HIGH SPEEDS
- FLOAT CONTROLLED LIQUID STORAGE TANK ENCLOSED

ROBERTS PATENT FILLING MACHINE CO. LTD.
BOLTON · ENGLAND
Phone: Bolton 4925 (2 lines). **Grams: 'Filling' Bolton.**







Clarks of Hull now design and fabricate in Stainless Steel, Mild Steel, Aluminium, etc.

QUICKLY, ECONOMICALLY AND EFFICIENTLY

After leading the field for over a hundred years in the fabrication of copper vessels, expansion joints, etc. Clarks of Hull have now—to cater for fabrications in stainless steel, mild steel, aluminium, etc. —erected a completely new Fabrication Shop. Newly-equipped with the most modern processes and staffed with hand-picked, highly-experienced personnel, Clarks' Fabrication Shop is in a position to combine excellent deliveries with high standards of workmanship —probably giving you more for your money too! A skilled design service is available.

- **Metallic Arc Welding**
- **Argonaut and Argon-Arc Welding**
- **Stress-relieving and testing facilities**
- **Agents or representatives in all parts of the country**

Plate preparation bay—new Fabrication Shop

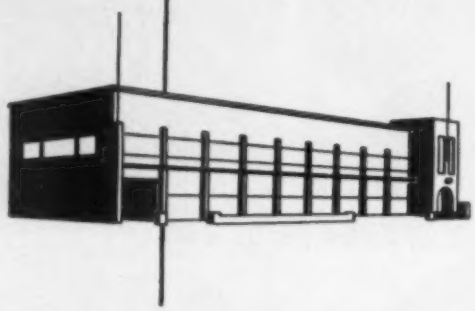
CLARK

FOR EVERY TYPE OF WELDED FABRICATION

GEORGE CLARK & SONS (HULL) LIMITED
HAWTHORN AVENUE · HULL
Telephone: 37654 Telegrams: "Clark, Hull"

A MEMBER OF THE NEWMAN HENDER GROUP

BCA



MENTHOL CRYSTALS du Crocq

2 outstanding qualities with melting point 42/44° and 32/34°

Made from finest Peppermint Oil

Jean A. du Crocq Jr. N.V. HUIZEN - HOLLAND

essential oils, aromatics, perfume-compounds, flavouring materials and food-colours

SAMPLES AND QUOTATIONS ON REQUEST

AGENTS FOR THE UNITED KINGDOM: **MOORGATE PRODUCE & CHEMICALS LTD.,**
17-18 Basinghall Street, London E.C. 2, Telephone MONarch 8300

An importment book for the biologist

Methods of Analytical Histology and Histo-Chemistry

By EDWARD GURR
F.R.I.C., F.R.M.S., F.L.S., M.I.Biol.

Royal 8vo. First edition. 70s. net.
Postage extra.

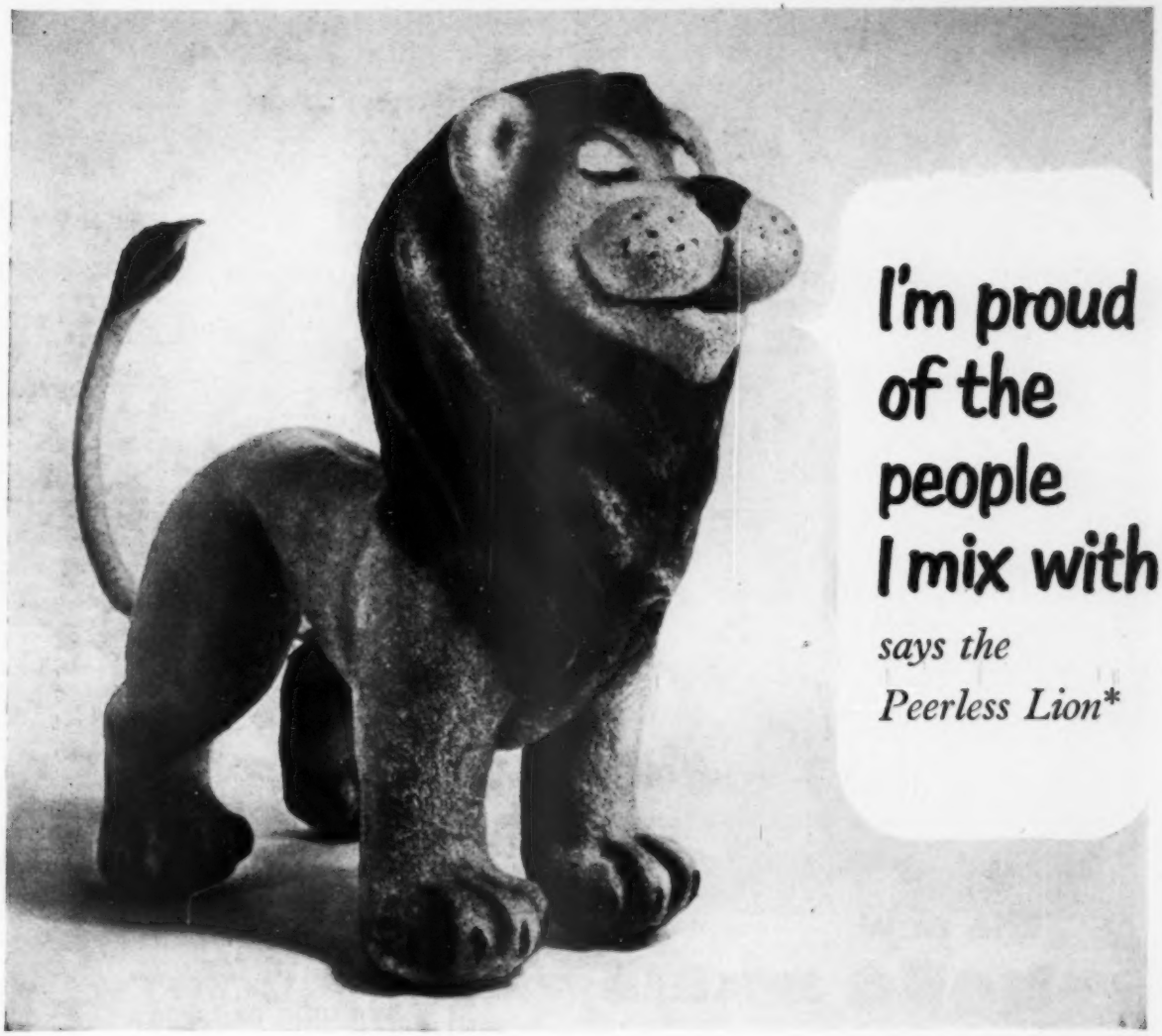
By the same author: *A Practical Manual of Medical and Biological Staining Techniques.* *42s. net.*

This book is concerned almost exclusively with the identification, by colour reactions, of chemical groups and elemental substances in microscopic preparations of normal and pathological tissues. Complex procedures are described step by step in a clear and straightforward manner which renders them easy to follow at the laboratory bench. The various sections of the book are introduced with explanatory matter, and with few exceptions, the methods are followed by notes and observations. In many cases, the author shows by means of chemical formulae the probable structure of the coloured compounds formed by the interaction of the tissue substances and the reagents employed in the methods described. These formulae, although at this stage may be of academic interest only, do not appear to have been put forward and published previously and they may well be of help in further research. There is a useful appendix, and there are a number of recipes and other information, copious references to literature are given.

The book, which fills a very real need in the medical and biological sphere, will undoubtedly be of great interest and value to a large variety of biologists, including anatomists, bacteriologists, biochemists, histologists, pathologists, etc., whether they happen to be teachers or students, or engaged in research or routine work.

Order through your bookseller

Leonard Hill [Books] Limited, Eden Street, London, N.W.1



I'm proud of the people I mix with

*says the Peerless Lion**

May & Baker, the University of Cambridge, British Industrial Plastics, Boots, Monsanto Chemicals, and I.C.I., are just a few of the big names who use Peerless mixers.

- Mixing capacities from 5 litres to 95 litres
- Varying speeds
- Epicyclic mixing action
- Automatic lubrication
- All working parts enclosed
- Stainless steel equipment
- Mixing bowls may be fitted with discharge valves.

If you have an unusually difficult problem, Peerless will develop a special machine to solve it. But probably you will find what you want in the wide Peerless range.

PEERLESS
FOOD MACHINES

Write to us for full technical details

PEERLESS & ERICSSON
Technical Dept., Carlisle Road, The Hyde, London, N.W.9. Phone: COLindale 8811

Sales and service located in all principal cities

* *The Peerless Lion is the hallmark of perfect mixing*

PHARMACEUTICAL PASTILLES

In addition to a large range of general medicated pastilles available either in bulk supplies or packed, we should be pleased to quote for pastilles manufactured to customers' own requirements.

We maintain :

1. Strict analytical control.
2. Free service from our laboratory in matching samples.
3. A high standard of workmanship.
4. Prompt deliveries.

PACKING FACILITIES AVAILABLE

Please address enquiries to : **POTTER & CLARKE LTD**
River Road · Barking · Essex

---

the new MONO *KWIKLEEN* pump

Designed for hygienic use and easily dismantled for cleaning

The pump is suitable for handling all fluid edible products. It can be used for vacuum extraction duties and the consistent rate of discharge makes it ideal for H.T.S.T. processing. Self-priming with 25 feet suction lift.

MONO PUMPS LIMITED
Mono House, Sekforde Street
London, E.C.1 'Phone: CLE 8911
Grams: Monopumps 'Phone London

and at Belfast, Birmingham, Capetown, Dublin, Durban, Glasgow, Johannesburg, Manchester, Melbourne, Newcastle, Wakefield

MP300

CONTROL SKIN INFECTION!

use antiseptic cleansers with

G-11® (HEXACHLOROPHENE)

The use of G-11 cleansers in washroom dispensers promotes better personal hygiene among employees . . . protects against skin disorders caused by bacteria. Hexachlorophene soaps and detergents reduce the number of bacteria on the skin and provide a built-in protection that continues to inhibit growth after washing. The use of ordinary soaps off the job will not interfere with the protective action of G-11 . . . the protection it affords clings to the skin.

G-11 is available in powdered, liquid or bar soaps, and in detergents and waterless hand cleaners. All G-11 soaps must meet rigid specifications for G-11 content. Hexachlorophene liquid soaps are the only antiseptic soaps recognized by the United States Pharmacopoeia and *must* be produced to stipulated specifications.

Ask your supplier for more information on products containing G-11.

GIVAUDAN & CO. LTD.

WHYTELEAFE · SURREY

TELEPHONE: UPPER WARLINGHAM 2841

Stabilag Flask Heaters—unrivalled in durability, service in use and all-round performance. The FIRST choice of really discriminating laboratory chemists.

STABILAG FLASK HEATERS

FOR EFFICIENCY AND SAFETY

Stabilag claim and can prove to have the most efficient heating mantle embodying the highest density load, the most intimate fitting and the strongest heating element with its patented wire laying method of construction.

STANDARD JACKETS *(100 ml—200 litre)*
7½ watts per square inch.
Temperatures up to 450°C.

STANDARD "HIGH-TEM" JACKETS
—for Glass, Quartz and metal vessels.
Standard loading 20 watts per square inch.
Temperatures up to 1,000°C.

HEATING TAPES
Also available are the Stabilag range of Laboratory Heating Tapes in glass and refrasil—temperatures up to 1,000°C.

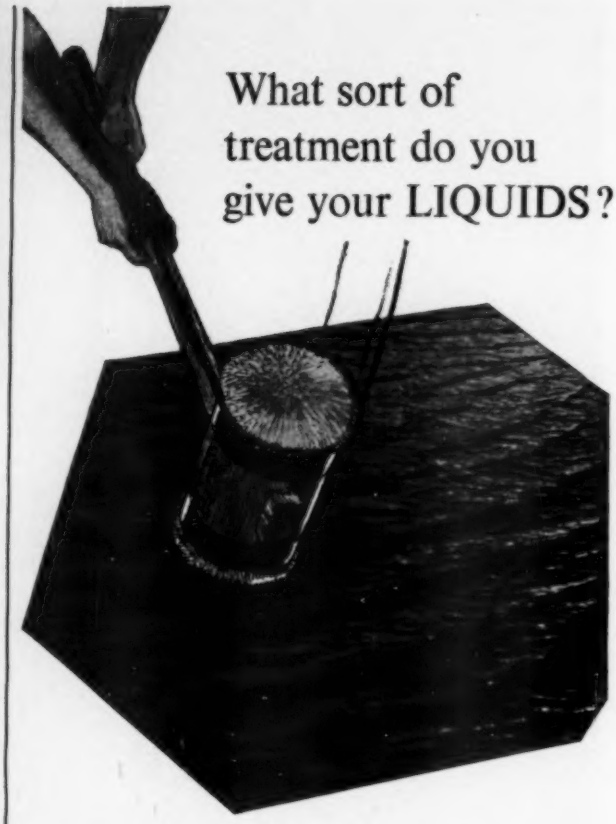
ALL THE STABILAG RANGE OF STANDARD EQUIPMENT IS NOW AVAILABLE EX STOCK FROM YOUR NEAREST LABORATORY FURNISHER

Manufactured in England by:

THE STABILAG COMPANY LIMITED

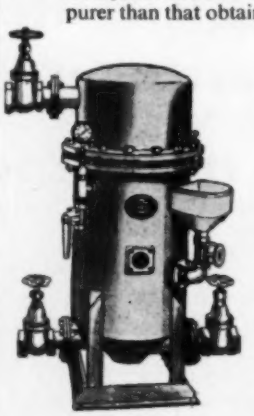
Mark Road · Hemel Hempstead · Herts · Telephone: BOXMOOR 4481

A80



What sort of treatment do you give your LIQUIDS?

Softening, filtering, clarifying or purifying—whatever the treatment needed by the water you use, you can rely upon Paterson plant to provide it. Plant that includes equipment for rapid gravity and pressure filtration, water softening systems of proved efficiency, and de-ionisation plant for producing water purer than that obtainable from single distillation.



And for other liquids there is the Stellar Filter, providing fine filtration of essential oils, spirits, chemical solutions, and water. Instant cleaning without dismantling or loss of liquid is only one of its many good points.

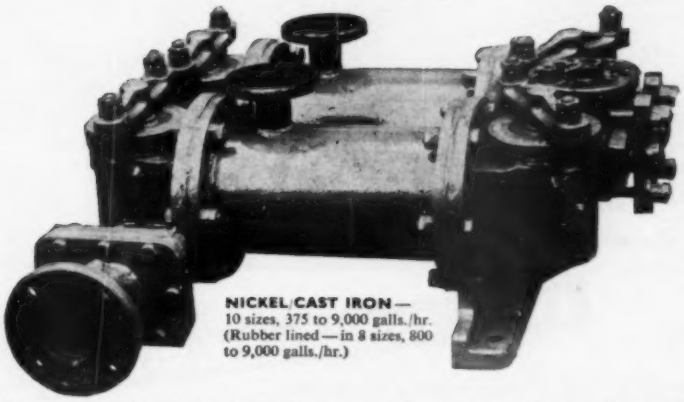
Small wonder Paterson plant is to be found in the many industries where supplies of pure water or filtered liquids are an essential part of the manufacturing process.

Whatever sort of treatment you want to give your liquids, have a word with Paterson about it first: over fifty years' experience has given them the answers to all your questions.

Paterson *for liquid treatment*

THE PATERSON ENGINEERING CO. LTD · 129 KINGSWAY LONDON W.C.2 · TEL: HOLBORN 8787

Troublesome Liquids need
TUNGSTONE PUMPS



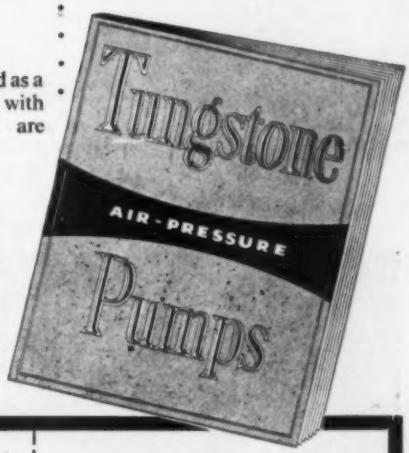
NICKEL/CAST IRON—
10 sizes, 375 to 9,000 galls./hr.
(Rubber lined—in 8 sizes, 800 to 9,000 galls./hr.)

Which particular liquid in your business presents its pumping problem? Is it an acid, a slurry, a sludge . . . gritty greasy, corrosive, erosive, sticky? A TUNGSTONE Pump will quickly take care of that—as many industries have proved.

These fine pumps specially evolved for the handling of 'awkward' liquids have two valuable features: (a) the unit can be supplied in a range of materials which resist corrosion by any particular liquid, (b) there are no packings or glands within the unit and there is nothing to clog or choke—air is used as a piston, although it never mixes with the liquid: maintenance costs are negligible.

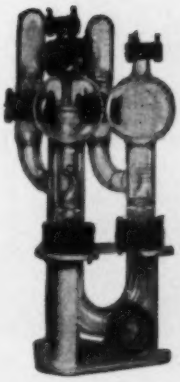
For any given pumping pressure the volume of air going to the pump can be controlled so that the pump's output can be varied from zero to maximum. The pump and whole length of delivery pipe containing valuable liquid can be emptied after each operation at the end of a shift.

FREE
A fully explanatory, illustrated brochure describing TUNGSTONE *Air Pressure Pumps sent on request.*

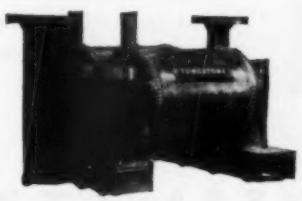


EBONITE PUMP, non-immersion type. Made in 3 sizes: 200, 375, 600 gallons/hour.

LEAD PUMP—immersion type. Made in 8 capacities: 375, 600, 800, 1,200, 1,500, 2,000, 3,000, 3,600 gallons/hour.



GLASS PUMP—"Pyrex" brand Borosilicate Glass. Made in two capacities: 300 and 800 gallons/hour.



non-immersion LEAD PUMP. Made in 8 capacities: 375, 600, 800, 1,200, 1,500, 2,000 3,000, 3,600 gallons/hour.

EBONITE PUMP, immersion type. Made in 3 sizes: 200, 375, 600 gallons/hour.

TUNGSTONE PRODUCTS LTD · MARKET HARBOROUGH ENGLAND · Phone Market Harborough 2245

7841

EN GARDE

THIOVANIC
(Regd. Trade Mark)

Vacuum Distilled THIOGLYCOLLIC ACID

SPECIFICATION

Assay $HS—CH_2—COOH$	75%
Dichlodiglycollic Acid	< 0·5%
Copper	< 1 p.p.m.
Iron	< 1 p.p.m.
Ash	0·03% max.
Specific Gravity	1·27
Colour	Water White
Odour	Faint sulphidic

Miscible with water, alcohol, ether.

Also available:
AMMONIUM THIOGLYCOLLATE
CALCIUM THIOGLYCOLLATE

Apart from its very extensive use in the manufacture of solutions for the Cold Permanent Waving of hair, and as an analytical reagent, this Mercapto Acid, with two reactive functional groups, offers interesting possibilities as an intermediate in the synthesis of a variety of products.

EVANS CHEMICALS LIMITED
Manufacturing Chemists

BOREHAM WOOD, HERTS, ENGLAND Tel. ELStree 2445/6-Grams. FACILITIES PHONE LONDON-CABLES FACILITIES LONDON

Overseas Agents: Robert Bryce & Co. Ltd., Melbourne, Sydney, Adelaide, Wellington, Auckland, Dunedin
Pugh & Co. (Chemicals) S. A. Brussels; Erling & Morton Lind Jr., Oslo; Jacobson Van Den Berg (S. A.) Pty. Ltd., Johannesburg

LANKRO CHEMICALS LTD.

use

WYNN

Diaphragm Valves

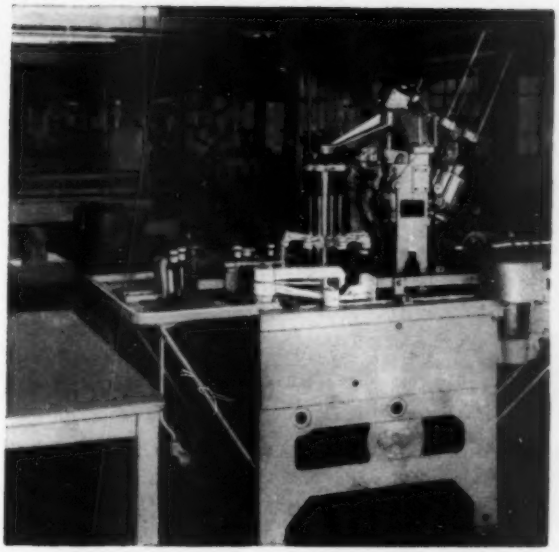
More than 800 Wynn Valves are in use in this well-known chemical plant. The illustration shows a number of these in the raw materials pump house.

WRITE FOR LATEST TECHNICAL INFORMATION.

STRAIGHT THROUGH

WYNN (VALVES) LTD.

GRANVILLE STREET, BIRMINGHAM, 1



PURDY

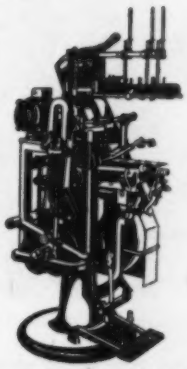
"UNIMATIC"

FULLY AUTOMATIC LABELLING MACHINES

Single or multiple labels can be applied to round, oval, flat, square, and polygonal containers, the labels being gummed all over to ensure perfect adhesion. Output depends on type of work, speeds up to 65 per minute with body labelling and up to 60 per minute with body and all-round-neck labelling.

Use PURDEX GUM in all your labelling machines.

This "UNIMATIC" at one of the Crosse & Blackwell Factories, is applying both body and neck label simultaneously, to the famous "BRANSTON SAUCE" bottle.



The "UNIVERSAL" Labelling Machine. Will apply two or three labels simultaneously such as body, shoulder and neck labels or even apply top strap labels, at the rate on simple work of up to 48 per minute.

PURDY MACHINERY CO. LTD

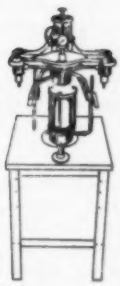
41-42 PRESCOT STREET · LONDON · E.1

ROYAL 8401

FARROW & JACKSON LTD

F&J

BOTTLING EQUIPMENT

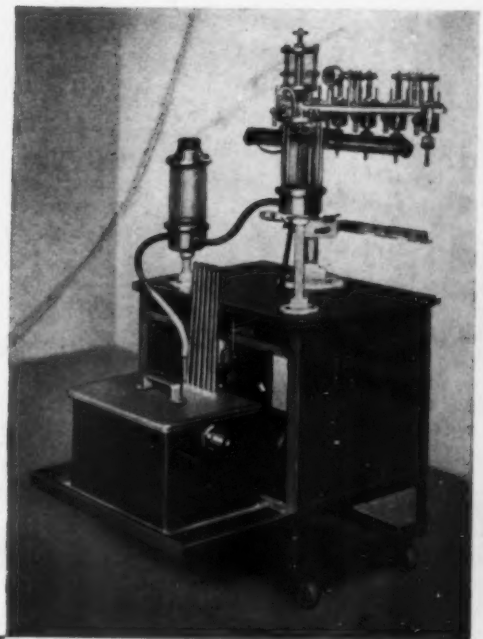


The one filling machine with four heads in pairs, worked by two operators. Gives high output in small space. Automatic overflow return.

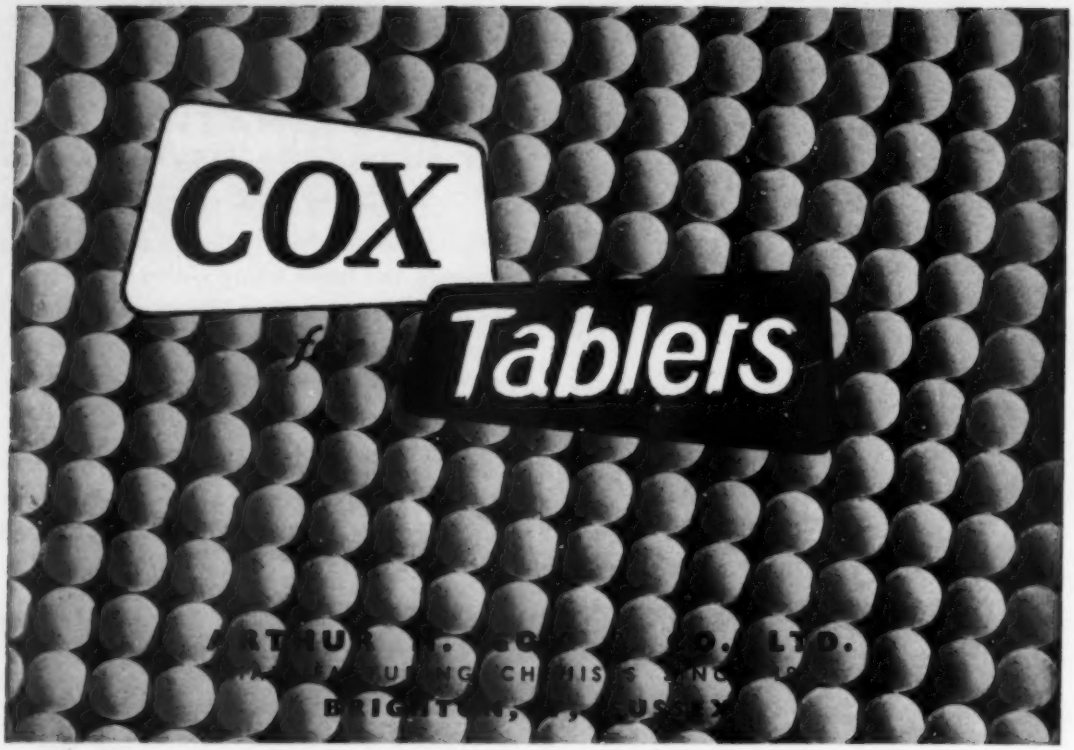
FILLING MACHINES

Here we see a six head Filling Machine, showing automatic overflow return and float controlled feed tank. A complete portable machine used for high production of all sizes of bottles. Smaller models available from two-head up.

Sole Selling Agents for the "HORIX" semi and fully automatic gravity filling machines for liquids and semi-liquids.



JACW/MC/1



THE **BARRYWALD** REGD.
Safety Automatic Incinerator

By the simple depression of a lever the **Barrywald Sanitary Incinerator** automatically destroys sanitary towels, surgical dressings, documents, etc.

It solves major and vital welfare and security problems in factories, offices, institutions, etc.

Write or phone today for illustrated leaflet or demonstration.

BECAUSE –

★ It is manufactured by the first and leading Sanitary Incinerator Specialists in the World.

★ It is guaranteed for one year and backed by a full service organization.

★ It is simple and cheap to install.

★ It is the only Incinerator incorporating our patented safety devices.

★ It is approved by The Royal Institute of Public Health and Hygiene.

★ It is regularly supplied to and approved by all H.M. Government Departments, Local Administrations and Educational Authorities, Hospital Management Committees, General Industry.

Patents Nos. 555062—621085 and corresponding Foreign Patents.

ECONOMICAL • EFFICIENT
FOOLPROOF • INDISPENSABLE

SANIGUARD APPLIANCES LIMITED
62, LONDON WALL, LONDON, E.C.2
Telephone: NATIONAL 8881 8882
DIVISION OF ALLIED METALS LTD.

The VIBROMIX in industry

So much more than a stirrer...

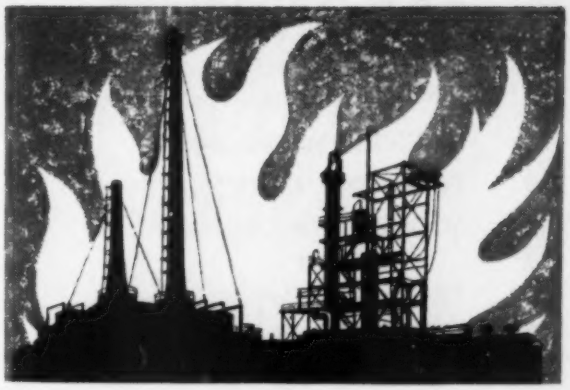
Here you have, in the Vibromix, a new mixing principle. Instead of revolving blades it has a mixing element vibrating up and down at mains frequency – that is, 6,000 times a minute. The materials are not only circulated but also subjected to considerable impact effect, giving rapid reactions and complete interfacial mixing. As there are no rotating parts, gas can be introduced into the liquid through a hollow shaft. Closed systems, as in the illustration, are very simply arranged by means of a membrane sealing unit.
The volumes given below are an indication of the capacity of the industrial models.

Model E2 (150 watt rating) for 20 to 200 litres.
Model E3 (300 watt rating) for 100 to 800 litres.
Model E4 (1,250 watt rating) for 300 to 5,000 litres.

The model to be used depends on the nature of the materials to be mixed and the volume to be handled. Please ask for questionnaire.

SHANDON

SHANDON SCIENTIFIC COMPANY LTD.
6 Cromwell Place, London, S.W.7 KNightsbridge 1131



Planned fire control is important!

ASBESTOLUX—the *non-combustible* asbestos insulation board has, time and time again, proved its effectiveness in preventing the spread of fire in chemical plants and laboratories. Constructional details have been evolved for a wide range of structural elements such as :—

- **Fire stops in roof trusses**
- **Columns, and other load bearing support casings**
- **Gable end protection**
- **General lining applications**

A planned "ASBESTOLUX lining specification" will prevent the spread of fire in your plant or laboratory : *AND* give thermal insulation *PLUS* extreme durability

ASBESTOLUX

THE NON-COMBUSTIBLE ASBESTOS INSULATION BOARD

CAPE BUILDING PRODUCTS LIMITED,
COWLEY BRIDGE WORKS, UXBRIDGE, MIDDX. *Tel: Uxbridge 4313*
ALSO AT:— MANCHESTER BIRMINGHAM GLASGOW NEWCASTLE

MAGNESITE

Calcined, Raw, Ground and Unground

MAGNESIUM CHLORIDE

POTASSIUM CARBONATE

SODIUM HYPOSULPHITE (all Grades)

TRIETHANOLAMINE

CITRIC ACID B.P.

TARTARIC ACID B.P.

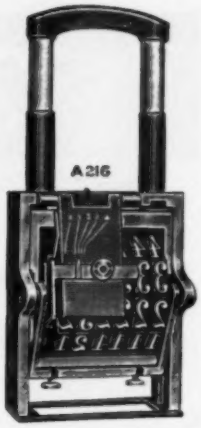
We can offer Heavy Chemicals for all types of Industry

TENNANTS
(LANCASHIRE) LIMITED

Hazelbottom Road
CHEETHAM
Manchester, 8.

Tel: COLLYHURST 4454/5/6/7

AUTOMATIC NUMBERING MACHINES



for quick and accurate marking of packing cases and cartons. Machines, as illustrated, supplied with rubber faced letters and figures give excellent results on wood or cardboard.

We manufacture all types of rubber stamps for office and factory use and have specialized in their production for over 70 years.

123

Our hand-stamps are particularly well made with highly polished Perspex mounts of a special design.

These are very attractive, so much easier to pick up the right stamp when in a hurry.

Write for lists and information.

E. M. RICHFORD LTD

8-9 SNOW HILL LONDON E.C.1 Tel. Cen 9241-2

In this completely rewritten and revised fourth edition of *Modern Cosmeticology* the entire field of cosmetic research and development is surveyed.

In no other work will one find such a combined wealth of medical and technical data appertaining to the subject, no matter whether it concerns the skin, its nutrition and scientific care; the hair (and the physico-chemical problems involved in 'washing' hair, including the potential hazards of certain detergents to the eye mucosa); the teeth, and the chlorophyllin dentifrices, or the lustre-producing properties of tooth-paste ingredients. This book is no mere compilation but includes the results of many of the author's own published investigations in the field of chemistry, dermatology and microbiology as well as in cosmetics. The work is profusely illustrated and is embellished by a number of photomicrographs, some by the author, others from the author's collection.

R. G. HARRY

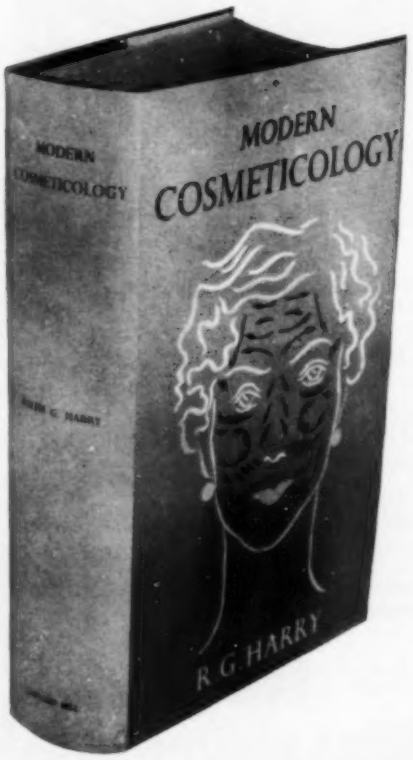
Modern Cosmeticology

Demy 8vo. Illus. xxxiv + 786 *pages. 65s. net.*
Postage 1s. 9d. Inland. 3s. 1d. Abroad.

Contents include: THE SKIN. THE CARE OF THE FACE. THE CARE OF THE MOUTH. THE CARE OF THE BODY. THE CARE OF THE HANDS. COSMETIC FACTS AND FALLACIES. GENERAL ASPECTS OF COSMETIC FORMULATION.

Order from bookseller

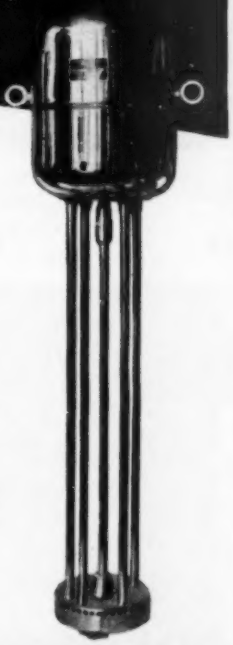
Leonard Hill [Books] Limited, Eden Street, London, N.W.1



DOUBLE YOUR PRODUCTION USING HALF THE POWER AND IMPROVE YOUR PRODUCT IN HALF THE TIME WITH A SILVERSON MULTI-PURPOSE MACHINE

SILVERSONS

MULTI-PURPOSE HIGH SPEED MIXER EMULSIFIER



The Silverson Machine is extremely versatile. It allows one operator to control the mix process. By simply changing the heads, or inserting emulsion screens, in SECONDS the action can be modified and controlled to give optimum processing for MIXING, EMULSIFYING, HOMOGENISING, STRAINING, FILTERING, PUMPING and many allied operations which guarantee extremely quick, thorough and stable process products.

IMMERSION BALL-MILL

This new high speed Silverson Ball-Mix reduces coarse and refractory raw materials to a perfect, smooth finished product in ONE operation using ONE vessel and in a fraction of the time taken by any other method. This is the greatest advance in milling technique to date.

SILVERSON MACHINE (SALES) LIMITED
55-57 Tower Bridge Road, London, S.E.1.
Telephone: HOP 1777 and NEW CROSS 5222.

Industrial Chemicals from China

ACIDS · ALKALIES
COAL TAR PRODUCTS
PETROLEUM PRODUCTS
PLASTIC MATERIALS

Chinese dyestuffs, fine chemicals and pharmaceuticals also supplied

For further information, write to:

China National Import and Export Corporation

Tientsin Branch, 171, Chien Sheh Road, Tientsin, China.

Cables to:
NOCIMOR TIENTSIN
(*for industrial chemicals*)
NOCIDYES TIENTSIN (*for dyes*)
NOCIPHARM TIENTSIN
(*for fine chemicals and pharmaceuticals*)

REXALL

DRUG COMPANY LIMITED

ANNOUNCE

that they have acquired the old-established business of

CARNEGIES OF WELWYN LTD.

founded by Robert Beaton Carnegie in 1911. Mr. D. M. B. Carnegie and his family have ended their connection with the business.

Carnegies of Welwyn Ltd., will continue to operate in Welwyn Garden City as manufacturers of bulk chemicals. A programme of expanded manufacturing is being put in hand.

The Company takes this opportunity to thank its many friends throughout the world for their past support and to assure them that every effort will be made to give even better service in the future.

Over 3,000 Pye pH Meters are distributed throughout the world, giving that unique service for which Pye products are famous: our large range of pH equipment—from the Portable to the new Dynacap—has been designed to meet all needs for research and industry. The Master, the Universal, the General Purpose and the Tropical pH Meter are for laboratory work and the pH Amplifier for industrial pH indicating, controlling and recording. A large range of electrodes is available; the Automatic Titrator can also be used in conjunction with Pye pH Meters. Please write for full details.

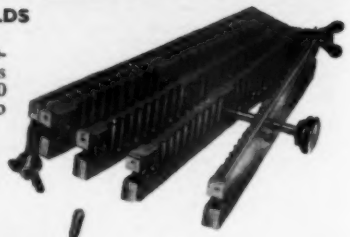
W. G. PYE & CO. LTD., | **Granta Works, Cambridge.**
Tel: Cambridge 54411 Grams: Pye Cambridge.

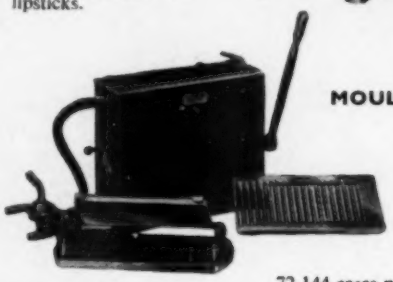
MOULDING

BY HAND OR BY MACHINE

HAND SPLIT MOULDS

For the production of suppositories and pessaries from 15 grains, to 120 grains, of both torpedo and conical shapes from 6 cavities to 144 cavities per mould. Also applicable to lipsticks.





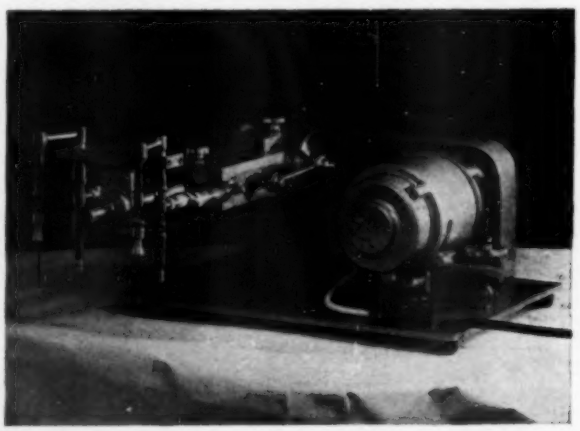
LIPSTICK MOULDING MACHINE

Used by leading manufacturers in Great Britain and many countries overseas. The Arden Water Cooled Machine moulds and fills 72-144 cases per operation without handling to any diameter or length.

Write for details of these Machines or any special moulding equipment

H. B. ARDEN & Co. (Instruments) Ltd.

371-7 Queensbridge Road, London, E.8. Telephone: Clissold 8302
Telegrams Inland: "Cosmould, Hack" London
Overseas: "Cosmould, London"



'Liliput' AUTOMATIC FILLING MACHINE

Auto mation ERU

with two or four filling positions. For filling bottles and ampoules of 0·5 ml. to 250 ml. at the rate of 3,000/6,000 per hour.

RUDOLPH W. FRITSCH

Apparatus and equipment for the pharmaceutical and chemical industry.

Richard-Wagner-str, 42 (parli), BAYREUTH, Germany.

The modern method of iron therapy without side effects

FERROUS GLUCONATE

Side by side with up-to-date equipment available today in hospitals, maternity wards and nursing homes are the very latest pharmaceuticals, painstakingly developed. Of such is Ferrous Gluconate, now widely accepted as the most satisfactory means of treating iron deficiency. Besides being inexpensive it is non-toxic, easily absorbed, well tolerated and noted for its absence of unpleasant side effects.

KEMBALL, BISHOP *Chemicals for Industry*

KEMBALL, BISHOP & CO. LTD · THREE MILL LANE · BROMLEY-BY-BOW · LONDON, E.3 · Tel: ADVance 1234 (7 lines)

WITH OVER 25 YEARS GRINDING EXPERIENCE WE SHOULD KNOW **25**

BAUERMEISTER TURBO MILL

The Bauermeister Turbo Mill is the Criterion of To-day FOR...

- HIGHEST DEGREES OF FINENESS
- A STEEP CURVE OF GRANULAR DISTRIBUTION
- HIGH OUTPUTS
- MINIMUM MAINTENANCE
- LOW POWER CONSUMPTION

Designed with electro magnetic or mechanical feeding devices

A full range of models.

Test laboratory facilities.

Prices to factory most reasonable.

Deliveries almost immediate.

Bramigk & Company Ltd.

ENGINEERS, 15 CREECHURCH LANE, LONDON, E.C.3

ESTABLISHED 1872 · CABLES: BRAMIGK, LONDON · AVENUE 4822-4825

C. Olley & Sons Ltd.

EST. 1844

CORKS
STOPPERS, SCREW CAPS
AND
CLOSURES
OF ALL TYPES

Telephone Royal 4922/3

CAMPERDOWN STREET,
LEMAN STREET, LONDON, E.1.

THE HALLMARK OF PURITY

For further particulars apply to:
TRADE AGENT FOR MYSORE
28 Cockspur Street, London, S.W.1
Tel.: Whitehall 8334/5
Grams: MYSOF Lesquare, London

ACID
MONOCHLORACETIC

SODIUM
MONOCHLORACETATE

Free of Di- and Tri-CHLORACETIC ACID

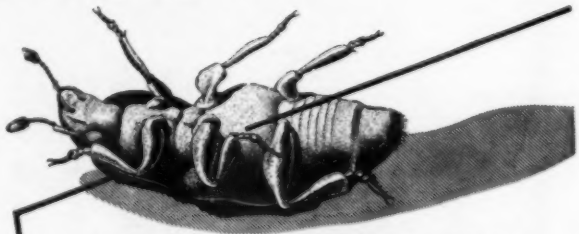
PECHINEY MANUFACTURE

KW
CHEMICALS LTD

55/57
HIGH HOLBORN
LONDON W.C.1
T.A. CHLORATE
T.N. CHANCERY
7981/5

Only African Pyrethrum . . .

Of all insecticides there is only one—African Pyrethrum—to which insects have shown no resistance of any practical significance



You will of course recognise the importance of this fact. But African Pyrethrum has one other overwhelming advantage—both from the manufacturer's and user's point of view. *African Pyrethrum can be used with a synergist or with other insecticides and still retain its properties.* This means that it is as economical in its use as most others. Further information regarding the many advantages of African Pyrethrum—its knockdown property, non-toxicity to mammals, etc.—and its many applications can be obtained from—

AFRICAN PYRETHRUM

AFRICAN PYRETHRUM TECHNICAL INFORMATION CENTRE LTD
4 Grafton Street, London W.1 Telephone: HYDe Park 0521

HEATING MANTLES

for the laboratory and for pilot plant

Electrothermal offers the largest range of heating mantles accommodating any size of glass, silica, porcelain or metal vessel.

CONSTRUCTIONS AVAILABLE ARE—

- SERIES M ... **standard aluminium housed mantles.**
- SERIES MV ... **"Multimantle", an aluminium housed multi-purpose mantle for use with a range of vessels.**
- SERIES MY ... **aluminium housed mantles of simplified design.**
- SERIES MJ ... **all-flexible mantles with the ingenious neck opening.**

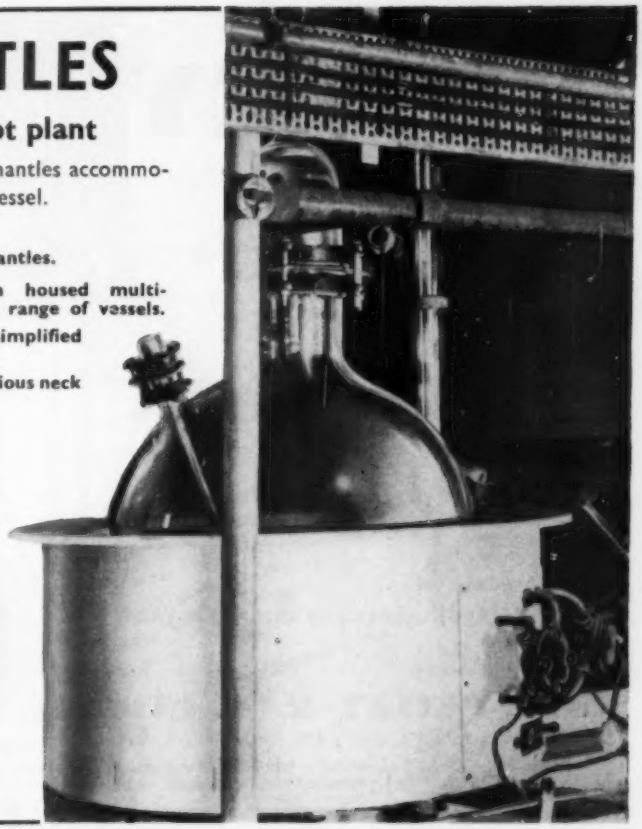
Available from all Laboratory Supply Houses

Apart from the standard ranges, mantles can be built for special requirements such as for operation

• in flameproof areas • with inert gas • at high loadings

Illustration shows 100 and 200 litre Series M mantles with Buxton certified connections in use at the Distillers Co. Ltd.

PLEASE REQUEST LEAFLET NO. MC 307/4



Electrothermal

ELECTROTHERMAL ENGINEERING LTD.

270 Neville Road, London E.7. *Tel.: GRAngewood 9911*

1,000,000 injections a week - faster - safer THANKS TO SNAPULES

With a million a week already being used and much of the British polio vaccine going into them, Snapules can safely be said to have "arrived". Hospital pharmacists all over the country are giving the lead to the steady replacement of old-fashioned ampoules by the quicker, safer Snapule.

Pack your injection solutions in Snapules (distilled water and drugs), and specify them in your quotations. To-day it's still an extra selling point which easily offsets the slight extra cost. Tomorrow it will be standard practice.

**Snapules are equally resistant to accidental breakage as ordinary ampoules.*

THE **Snapule** REGD.

Patented Great Britain and abroad.

EASY-OPEN AMPOULE—NEEDS NO FILE

GLASS CONTAINERS (MEDICAL) LIMITED, LIVERPOOL

PETLEY

for

LIME

and

PEPPERMINT OILS

Sole Agents for

FRITZSCHE BROTHERS INC., NEW YORK

Ask for quotations.

P. T. PETLEY & CO. LTD

53/54, ST. JOHN'S SQUARE, LONDON, E.C.1

Tel.: Clerkenwell 4553 (4 lines). *Cables:* Merypet, London

What is the end of your end product?

W. H. MARTIN LTD.
THE SHIPPING AND FORWARDING AGENTS
3 & 4, Rangoon St.
London, E.C. 3
ROYal 6735 (10 lines)
ROYal 1055

1, Albert Street
Birmingham 4
CENtral 6938

and at Liverpool and other principal ports in the U.K.

W. H. MARTIN (CANADA) LTD.
51, Yonge Street
Toronto, 1
Ontario, Canada

Is it when it leaves the production line or when it reaches your customer overseas?

MARTIN'S TRANSPORTATION SERVICES, with their Agents and Correspondents in every country, can bridge the gap between the end of your export production line and prompt and safe delivery to your customers anywhere in the world.

All or any of the necessary but complicated services of packing, transport by air, sea, rail or road, documentation, customs, insurance, etc., etc., are provided by a competent staff under personal supervision to meet your special requirements.

Martins

will take care of it

It's fine PINE DELCO

• • •

W. M. DELF (L'POOL) LTD

130/2, RICE LANE L'POOL. 9

Sole Manufacturers of

DELCOPINE DISINFECTANT

FLUID

(GREEN OR BROWN)

Special Quotations to the Trade

PACKED IN 1·5·10·40-GALL. DRUMS

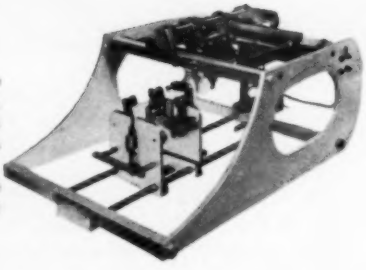
RONDEC

SCREEN PRINTING EQUIPMENT

For clear, durable prints on flat or cylindrical containers

RONDEC MODEL 102

This air operated machine prints direct on to Bottles, Jars, Tins, Phials, etc., from ½" to 4½" in. diameter at rates up to 500 per hour.
Setting and operation may be carried out by unskilled labour.

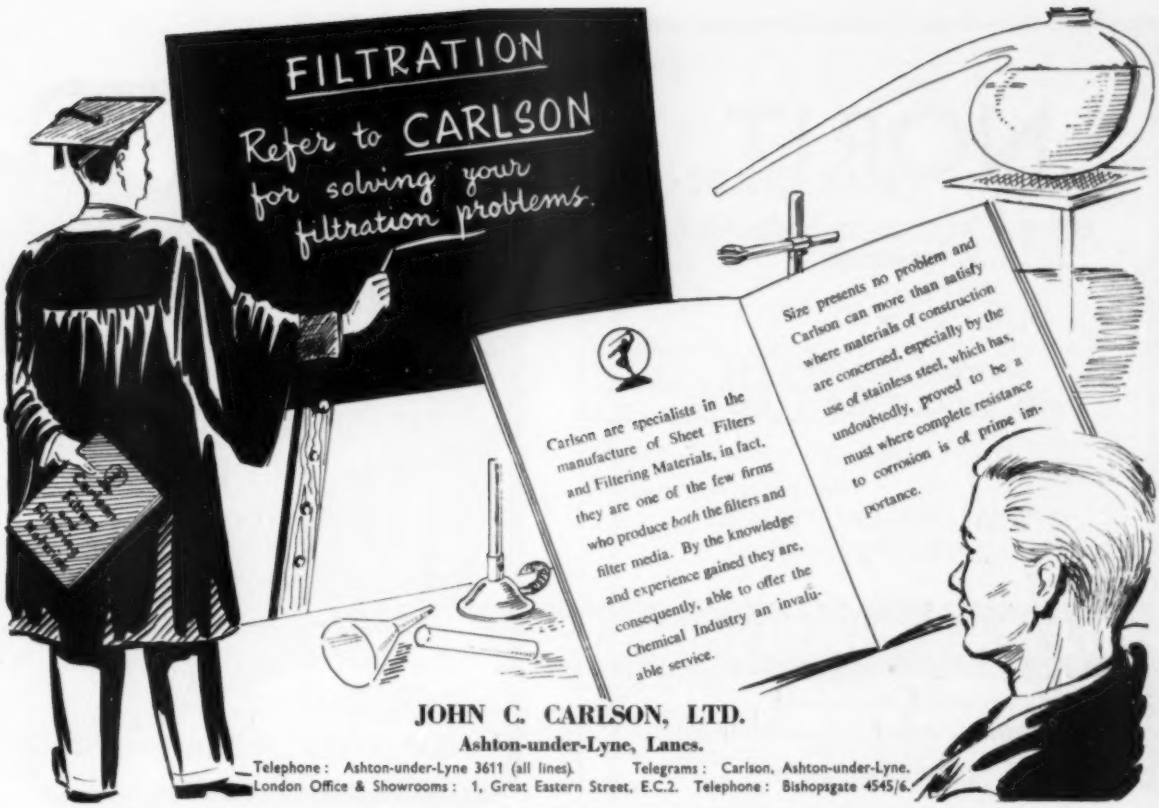


- Comprehensive screen supply service.
- Brochures and samples on request.
- Demonstrations arranged.

GAYLER & HALL LTD.

137 HANWORTH ROAD, HOUNSLOW, MIDDX.

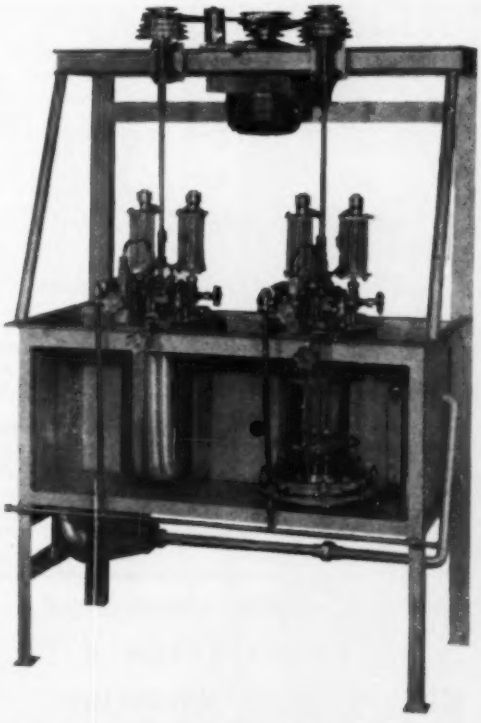
Telephone: HOUnslow 7251.


FILTRATION
Refer to CARLSON
for solving your
filtration problems.
Carlson are specialists in the manufacture of Sheet Filters and Filtering Materials, in fact, they are one of the few firms who produce *both* the filters and filter media. By the knowledge and experience gained they are, consequently, able to offer the Chemical Industry an invaluable service.
Size presents no problem and Carlson can more than satisfy where materials of construction are concerned, especially by the use of stainless steel, which has, undoubtedly, proved to be a must where complete resistance to corrosion is of prime importance.

JOHN C. CARLSON, LTD.
Ashton-under-Lyne, Lancs.
Telephone: Ashton-under-Lyne 3611 (all lines). Telegrams: Carlson, Ashton-under-Lyne.
London Office & Showrooms: 1, Great Eastern Street, E.C.2. Telephone: Bishopsgate 4545/6.

Stainless Steel laboratory fermenters

T
R F



Based on the design of Professor E. B. Chain, F.R.S. of the International Centre for Chemical Microbiology. Showing alternative glass and stainless steel vessels (front of water bath removed for clarity).

We will be pleased to receive your enquiries for these or any other type of stainless steel equipment you may require.

THE TAYLOR RUSTLESS FITTINGS CO. LTD.

Head Office: Ring Road, Lower Wortley, Leeds 12. Tel. Leeds 638711/2/3.
London Office: 14 Great Peter Street, London, S.W.1. Tel. Abbey 1575.

NORIT

HIGHLY ACTIVATED VEGETABLE CARBON

★

FAMOUS FOR PURITY
AND DECOLORIZING VALUE

★

SPECIAL GRADES TO SUIT
EVERY PURPOSE

★

HALLER & PHILLIPS LTD.
14 WOOL EXCHANGE,
BASINGHALL STREET, LONDON, E.C.2.

Telephone: MON 9041/2

JKL

TANNIC ACID
STRYCHNINE
PARIS GREEN
Delivery ex stock.

BARIUM CARBONATE
ZINC PHOSPHIDE
for prompt shipment.

JOHN KELLYS (LONDON) LTD.
24 Old Broad Street,
LONDON, E.C.2
Telephone: LONdon Wall 6585 (4 lines)
Teleg. (Inland): "Ergotine, Stock, London"
NEW YORK • HAMBURG

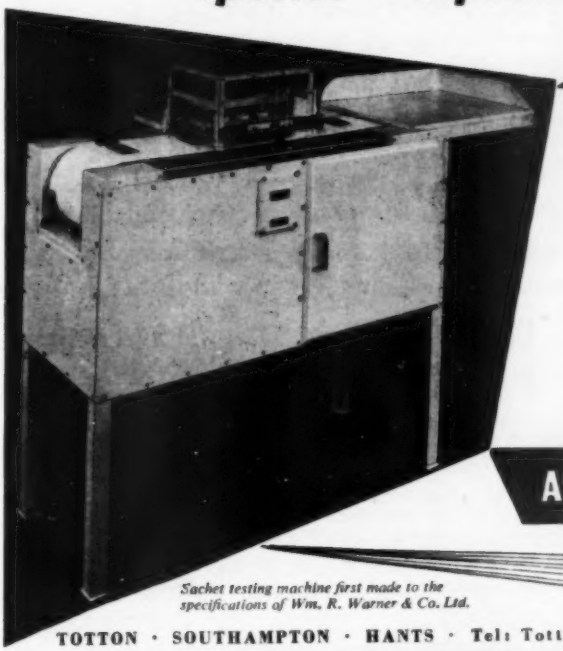
SULPHONATED CASTOR-OIL
TURKEY RED OIL
CASTOR OIL SOAPS
SOLUBLE OILS, ETC.
Textile and technical qualities.
THE
UNITED INDIGO & CHEMICAL CO. LIMITED
HEAD OFFICE: MANCHESTER 4
Telephone: BLAckfriars 7125/6/7

METABISULPHITE OF POTASH
EFFECTIVE PRESERVATION FOR ALL KINDS OF FOODS AND DRINKS
MAXIMUM SO_2 CONTENT
GRADED CRYSTALS, POWDER AND TABLET FORM
Write for samples, prices and analysis to:
F. KENDALL & SON LTD.
Stratford-on-Avon
Tel: Stratford-on-Avon 2031

CHEMICALS AND FEEDS LIMITED
ADELAIDE HOUSE, KING WILLIAM STREET, LONDON, E.C.4
Tel.: Mansion House 9621 (3 lines) *Cables: "Chemifeed" London*
CALCIUM CHLORIDE
PEARL ESSENCE
METHYL BROMIDE
(in 1 lb. seamless tins)
Associated with: P. Leiner & Sons, Ltd., Treforest Chemical Co. Ltd., Glamorgan Alkali & Acid Co. Ltd., Miskin Lime Co. Ltd. and other U.K. and Overseas manufacturers.

SHELLAC, GUMS, RESINS, etc.
as imported or ground or pulverised to all standard and special requirements
Write or telephone for samples to:
WOODHAMS, DADE & CO.
36, GRACECHURCH STREET, LONDON, E.C.3
Phone: MANSION HOUSE 0055-6-7
Grams: "WOODADE, LONDON" *Telex:* 22655.

Special Purpose MACHINES



We undertake the design and manufacture of all types of Special Purpose Machines and labour-saving equipment. Let us help you solve *your* problem, as we have helped others.

AUTOMATION DEVELOPMENTS LTD

IN ASSOCIATION WITH SOUTHERN APPARATUS CO. LTD.

Sachet testing machine first made to the specifications of Wm. R. Warner & Co. Ltd.

TOTTON · SOUTHAMPTON · HANTS · Tel: Totton 3141-3

For conductivity measurements on distilled or deionised waters of high purity you would do well to choose a Pye Conductivity Meter 'W'. It has a range of 0.1—100 micromhos and can, if necessary, be panel-mounted to drive recorders, etc. The Pye Conductance Bridge measures from 0.1 micromho—10 mhos in four switched ranges, and gives extra accuracy in analytical and quality control determinations. The Milcometer measures the conductivity of milk and detects mastitic disorders in cows. A variety of Conductivity Cells is available. Please write for full particulars.

W. G. PYE & CO. LTD., | Granta Works, Cambridge. Tel: Cambridge 54411 Grams: Pye Cambridge.

Purpose-made PROTECTION

All Whaley Bridge garments are well tailored and manufactured to the highest standards and they combine attractive styling with protection. Whether you require small or large quantities, delivery is prompt and our organisation covers the supply of badges or monograms (to establish ownership) at slight extra cost and without delay. Garments can be supplied in cotton drill, poplin, nylon, or Terylene. Sizes include fittings from 32" to 46", covering heights from 5' 3" to 6'.

KINGSTON

Recommended for wear where complete protection is required. Two outside patch pockets only.

BYFLEET

Two-piece suit designed for wear in sterilized areas and dust free rooms. Can be supplied with elastic at wrist and ankles or with separate over-boots. A skull cap completes the outfit which is minimum lint shedding.

Send now for our brochure W.B.8. detailing the wide range of overalls and headwear available. This is the most comprehensive protective clothing catalogue issued to date and has been compiled to enable the customers to select their special requirements with ease.

WHALEY BRIDGE MANUFACTURING CO.

WHALEY BRIDGE (via Stockport, Cheshire)

Tel: Whaley Bridge 73.

London Office: 285 Regent Street, W.1. Tel. Regent 1919.

WB OVERALLS

dm WB7/

SOYA LECITHIN

for Pharmaceuticals and Cosmetics

OLEIC ACID STEARIC ACID

CASTOR OIL · WOOD OIL · TURPENTINE

DIPENTENE · PINE OIL · ROSIN

WAXES (NATURAL AND SYNTHETIC)

WYNMOUTH LEHR & CO. LTD.

2 Thames House · Queen Street Place · London, E.C.4

Internat. Telex No. 28293
Cables & Foreign Telegrams: LEHRCOMP LONDON
Inland Telegrams: LEHRCOMP, LONDON TELEX.
PHONE: CITY 4737 (4 lines)

CAMPHOR

(Technical and B.P.)

PEPPERMINT OILS

MENTHOL CRYSTALS

STAR ANISEED OIL

CASSIA OIL

FOLIC ACID

McKESSON & ROBBINS LTD

UNIVERSAL HOUSE, SOUTHWARK BRIDGE, LONDON, S.E.1

The West Indies produce

ESSENTIAL OILS
Lime oil, orange oil, grapefruit oil, bay oil

SPICES
Pimento, annatto, nutmegs and mace, ginger

STARCH
St. Vincent arrowroot is the highest grade starch available

For detailed information apply to:

THE COMMISSION FOR THE WEST INDIES, BRITISH GUIANA AND BRITISH HONDURAS

6-10 Bruton Street, London, W.1 *Tel: Grosvenor 3871/3875*

DI CHLOR META XYLENOL

PARA CHLOR META XYLENOL

- LIQUOR CHLOROXYLENOLIS (B.P.)
- CHLORINATED XYLENOLS
- CARBONATE OF POTASH (All Grades)
- CAUSTIC POTASH (All Grades)
- MODOCOLL (Cellulose Ether)
- TRIETHANOLAMINE
- POLYETHYLENE GLYCOLS

CHAS. PAGE & CO. LTD.

52, GROSVENOR GARDENS, LONDON, S.W.1.

Telephone: Sloane 8151 (6 lines) Sloane 2831, 5931, 5953
Telegrams: Inland: "Paganini, Sowest, London" Foreign: "Paganini London"

also at **Sale, Manchester & 41 St. Vincent Place, Glasgow**

COLOURS for Pharmaceutical, Cosmetic and Industrial Purposes

W. S. SIMPSON & CO. (THE BRITISH ANILINE DYE AND CHEMICAL WORKS) LIMITED

1-23 Linden Way, Old Southgate, N.14. Tel.: PALmers Green 0196

"CARMOSS"

Gels, Suspends and Thickens

Food, Pharmaceutical and Cosmetic Products

J. W. CUMMING & SON Ltd., 5 Tithebarn St., Liverpool 2

Phone: CENtral 7688 *Grams:* "CARMOSS" Liverpool 2

MICHROME STAINS, ETC.

for Microscopy, Biology & Histochemistry

Bromcresol Green	Giemsa Stain	Sodium Taurocholate
Carminic Acid	Janus Green, B.	Toluidine Blue
Celloidin	May-Grunwald Stain	Urease &c.

62-page catalogue available on request

Quality. Service. Reliability. Immediate Delivery

EDWARD GURR LTD.

42 Upper Richmond Road West, London, S.W. 14, England
Telegrams: Micromlabs, Put, London. Telephones: PROspect, 8051 & 7606

PLANETARY STIRRING APPARATUS

Planetary stirring apparatus, 7-120 litres. The only machine in the world with adjustable planet guide and a counter-rotating basin scraper. Performance and operating method are unequalled. Great engine power, smooth control.

F. HERBST & CO., NEUSS/Rh.15

Bergheimer Str. 31, West Germany Agents wanted

All Pharmaceutical Machinery and Equipment

—also for small-scale production and laboratory purposes.

JOSEPH DECKELMANN, Aschaffenburg, (West Germany)

Formulary of Perfumery

R. M. GATTEFOSSÉ Translated by A.R.I.C.

A most valuable book for all cosmeticians and perfumers. Gives a large number of formulae for all types of perfumes and cosmetics.

First English edition. Demy 8vo. xiii + 252 pages. 17s. 6d. net.

Leonard Hill [Books] Limited

9, EDEN STREET, LONDON, N.W.1

Obtainable through your usual bookseller.

ZINC OXIDE B.P. PURISS

For Pharmaceutical and Cosmetic Use

H. LATTIMER

22 Upper Ground, Blackfriars Bridge, S.E.1

Tel.: Waterloo 5800 Grams: Glebeless, Sodist, Land. Cables: Glebeless Land.

CLASSIFIED ADVERTISEMENTS

Rates: 4/- per line,
Minimum 12/-, Box No. 1/-
45/- per single column inch.
Classified Advertisements must be prepaid. Wording should be sent, with remittance, to:

CLASSIFIED ADVERT DEPT.
Manufacturing Chemist
LEONARD HILL HOUSE
EDEN STREET, LONDON, N.W.1

SITUATIONS VACANT

GHANA

An important organisation in Ghana, West Africa, invites applications for the following vacancy:

Manager (Commercial): for Soap Factory mainly producing washing soap in bars. Wide experience of soap manufacture desirable but emphasis should be on aspects of buying, costing and sales for this industry. Sound knowledge of competitive marketing and general administration essential. Salary in range £1,350-£1,600 p.a.

Age limit for the above post is about 50. Salary according to qualifications and experience, and generous terms and conditions offered to the right person, subject to satisfactory medical examination.

Please write for application form and further particulars to Box MC.708, Austin Knight Advertising, 212a, Shaftesbury Avenue, London, W.C.2.

SALES Representative required to cover the London and Home Counties, by old-established firm of Engineers manufacturing machinery for the Chemical and Paint Industries.—Apply Box 2914B, *Manufacturing Chemist*, Leonard Hill House, 9, Eden Street, London, N.W.1.

SALES Manager (Mixers) required by small, old-established, rapidly expanding firm manufacturing "Z" Blade, "U" Trough and other types of Mixing machines. Unique opportunity for the right man, with a considerable future ahead.—Write, in confidence, Frank Winkworth, Winkworth Machinery Ltd., 65, High Street, Staines.

SITUATIONS WANTED

M.Pharm. from India with doctorate from Munich University, at present employed in Germany, seeks responsible position.—Box 2916B, *Manufacturing Chemist*, Leonard Hill House, 9, Eden Street, London, N.W.1.

MACHINERY AND PLANT FOR SALE

TWO only: B.E.N. Air Compressors with storage tank, Type FA70, 3½ in. bore, 4 in. stroke, 710 r.p.m., 150 p.s.i., air cooled. Mounted on horizontal tank 1 ft. 8 in. diam. by 5 ft. long, 5 h.p., 440/3/50 motor without starter—good condition. One only: Arenco Type G.A.B. Tube Filling machine for creams. 22 pocket endless tube conveyor for 1¼ in. and 1½ in. tubes. Complete with s.s. hopper A.S.E.A. motor 420/3/50 0.37 kW, complete with starter and reduction gear—excellent condition. Three only: Vickers "Empire" Stitchers 18 in. arm, ½ h.p., 440/3/50 complete with starter—excellent condition. Inspection of any of the three items can be arranged.—Aspro-Nicholas, Slough 23971.

PAXMAN self-contained economic Steam Boiler, 4/5,000 lb. evap. Cochran No. 20 Vert. Boiler, 4,800 lb. evap. Lancashire Steam Boiler, 24 ft. by 6 ft. 6 in., 4,700 lb. evap. All 100 lb. w.p. Quantity of 12 in., 14 in. and 15 in. Flanged Steel Piping.—Kimmins and Sons Ltd., Lyndhurst Road, Worthing.

ELECTRIC forklift truck, 1 ton cap, Squeeze clamp optnl., 9 ft. 10 in. lift, 1½ yrs., exc. cond., others available, also Pallet and Stillage transporters.—Dudley J. Cary, Mayes Park, Warnham, Sussex.

MACHINERY AND PLANT FOR SALE

Miracle Mills
(Regd. Trade Mark)
Grind in one operation to desired Fineness

GUMS	RAYON	LIMESTONE
GLUE	YEAST	SULPHATES
BORAX	BARIUM	PHOSPHATES
ROOTS	BITUMEN	FERTILISERS
SALTS	AGETATE	CAUSTIC SODA
CASEIN	CARBONATES	QUILLA and other BARKS

Scope of Products successfully handled practically unlimited

MAXIMUM OUTPUT at LOWEST COST

OVER 17,300 SATISFIED USERS

Write for catalogue M.C.
MIRACLE MILLS LTD
90 LOTS ROAD
LONDON, S.W.10,
Telephone: Flaxman 1456 (5 *lines*)

STEAM Still by Manesty Machines Ltd. Output per hour 50 gal. Net weight 1,200 lb. Fitted with Aquastat. £100.—Elliman Sons and Co. Ltd., Chandos Street, Slough, Bucks.

MANUFACTURERS of sectional water storage tanks, 50 to 40,000 gallons capacity. Sewage and Effluent Pumps.—G. L. Murphy Limited, Imperial Works, Menston, Nr. Leeds.

PORTABLE Stirrers, high- and low-speed, also variable speed for laboratory and small scale production.—Fluid Equipment Co. Ltd., 83, Seafield Road, London, N.11. Tel.: ENTerprise 2565.

PFAUDLER 200 gal. capacity glass-lined Mixing Tank, fitted with bronze agitator. Cannon 100 gal. capacity glass-lined jacketed Pan suitable for 40 lb. per sq. in. steam working pressure. 100 gal. capacity copper jacketed Pan.—Apply C. Skerman and Sons Ltd., 118, Putney Bridge Road, London, S.W.15. Tel.: Vandyke 2406.

MACHINERY AND PLANT FOR SALE

ALITE type LF Powder Filling Machine with motor drive. Weir Hydro Extractor with ebonite-lined perforated basket 26 in. underdriven from self-contained motor.—Apply Box 2917B, *Manufacturing Chemist*, Leonard Hill House, 9, Eden Street, London, N.W.1.

HAND Goods Lift, capacity 5 cwt., lifts 8½ ft. Dimensions 3 ft. by 3 ft. £120.—Elliman Sons and Co. Ltd., Chandos Street, Slough, Bucks.

SILICONE Rubber Bungs, tubing, sheet, bottle cap liners, washers and mouldings made to specification.—Esco (Rubber) Ltd., 34/36, Somerford Grove, London, N.16.

BUSINESS OPPORTUNITIES

EXPANSION of Plant. Reputable firm making bath cubes for the trade is able to take further contracts.—Box AC4368I, Samson Clarks, 57/61, Mortimer Street, W.1.

WELL-EQUIPPED Factory in the South of Ireland, not fully employed, prepared to undertake the manufacture or packaging of additional lines, under the framework of existing management or other mutually satisfactory arrangement. Ample capital available.—Replies which will be in strict confidence to Box 2907B, *Manufacturing Chemist*, Leonard Hill House, 9, Eden Street, London, N.W.1.

A nationally known manufacturer is
WILLING TO INVEST CAPITAL
in a company with well accepted consumer products which requires additional financial resources to secure greater sales development.
Mutual marketing arrangements might be considered using the existing national sales force and international connections of the advertiser.—Reply to Box 2915B, *Manufacturing Chemist*, Leonard Hill House, 9 Eden Street, London, N.W.1.

MANUFACTURING facilities available for a variety of Chemical and Allied Products. Any proposition investigated and strictest confidence observed.—Write Box 2908B, *Manufacturing Chemist*, Leonard Hill House, 9, Eden Street, London, N.W.1.

BUSINESS OPPORTUNITIES

A PROSPEROUS INTERNATIONAL COMPANY

with its own well-established and leading brands already distributed through chain stores, grocers and chemists shops in the U.K. is now prepared

TO BUY FOR CASH

companies, especially private companies, whose products are sold through these same trade channels. Consideration may also be given to the acquisition of successful brands distributed either locally or nationally.

Replies should be made only by principals, their solicitors, accountants or bankers to Box M.C.150, c/o 191, Gresham House, E.C.2.

BUSINESS OPPORTUNITIES

HOUSEHOLD POLISH COMPANY

Advertiser wishes to purchase for cash, medium or small size household polish company. Reply to Chairman, Box 2911B, *Manufacturing Chemist*, Leonard Hill House, 9, Eden Street, London, N.W.1.

PATENTS

THE Proprietor of British Patent No. 725877 which relates to *Improved Vent Sealing means for Feeding Bottle Nipples* is desirous of exploiting the invention by way of licence or sale. Enquiries should be addressed to Andrews and Byrne, 201, Bank Chambers, 329, High Holborn, London, W.C.1.

PATENT No. 776995 *Rubberised Bandage* for sale or licence.—Apply: Chatwin and Company, Chartered Patent Agents, 253, Gray's Inn Road, London, W.C.1.

PATENT No. 740189 *Bottle Stopper* for sale or licence.—Apply: Chatwin and Company, Chartered Patent Agents, 253, Gray's Inn Road, London, W.C.1.

MISCELLANEOUS SALES

REDUCTION Geared Motor, any size or speed or voltage, available from stock.—Universal Electrical Co., 221, City Road, London, E.C.1.

FOR Sale: Two Wine Vats rendered surplus upon re-organisation. Both are of modern type and constructed of best seasoned oak with ½ in. diam. steel hoops and screw cramps, used for Ruby Wine. Each of the following dimensions: diam. 11 ft. 5 in., height 6 ft., capacity 3,050 gal., oak 1½ in. Offers invited.—Coleman and Co. Ltd., Wincarnis Works, Westwick Street, Norwich.

FOR SALE

REGULAR supplies of Soda Lime 4/7 and 8/12 mesh available.—Enquiries to Box 2913B, *Manufacturing Chemist*, Leonard Hill House, 9, Eden Street, London, N.W.1.

SMALL Motorised Triple Mill (steel rollers) (Pascall Engineering). Purchased for use, Lipstick, laboratory, condition perfect. Rollers can be heated if required. Very suitable for grinding pilot plant mixings such as foundation creams, lipstick mass, colour pastes, inks, etc., reasonable offer accepted.—Mr. Enderby, 29, Cambridge Road, Southport.

VITAMIN A Oils—all potencies—regularly available in drums and tins.—Box 2879B, *Manufacturing Chemist*, Leonard Hill House, 9, Eden Street, London, N.W.1.

FOR Sale: China Clay, finest English Ceramic/Refractory/etc.; Powder; Special price: 145s. per ton f.o.r.—Henshaw and Co., 97, Clearmount Road, Weymouth. Tel.: 448.

PULVERISING, CRUSHING

MANGANESE, Graphite, Charcoal, Soldering Fluid, Bituminous Compounds. Pulverising, crushing, grinding.—Thomas Hill-Jones Ltd, Invicta Works, Bow Common Lane, London. E.3. Tel.: East 3285.

PULVERISING, Grinding, Mixing, Drying. We collect and deliver.—Crack Pulverising Mills Ltd., Plantation House, Mincing Lane, London, E.C.3. Tel.: MANsion House 4406.

WANTED

MICROBIOLOGICAL Fermentation Facilities required for small-scale production for fermentation products. Fermentor capacity up to 100 gal. scale would be adequate, together with the necessary facilities for media preparation, etc.—Box 2900B, *Manufacturing Chemist*, Leonard Hill House, 9, Eden Street, London, N.W.1.

PUBLIC APPOINTMENTS

THE University of Leeds. Applications are invited for Imperial Chemical Industries Limited Research Fellowships in Bacteriology, Biochemistry, Biomolecular Structure, Botany (Plant Biochemistry and Biophysics), Chemical Engineering, Chemistry, Chemistry of Leather Manufacture, Chemotherapy, Colour Chemistry and Dyeing, Engineering (Civil, Electrical or Mechanical), Fuel and Refractories, Geology (including Geochemistry), Metallurgy, Mining (Selective Flotation and Geophysical Surveying), Pharmacology, Physics, Physiology or Textile Industries (Chemistry of High Polymers [keratin and man-made fibres], Textile Technology and Textile Engineering). The Fellowships will be of an annual value within the range of £700-£1,000 a year according to qualifications and experience and will normally be tenable for three years. Further particulars can be obtained on request.—Three copies of applications (one in the case of applicants from overseas), together with the names of two referees, should reach the Registrar, The University, Leeds, 2, not later than March 7, 1959.

CAPACITY AVAILABLE

EVANS of ELSTREE

fill and pack bottles and metal or plastic collapsible tubes

EVANS Chemicals Ltd.

Boreham Wood, Herts. Phone: Elstree 2445/6

WHEN REPLYING TO CLASSIFIED ADVERTISEMENTS PLEASE MENTION "MANUFACTURING CHEMIST"

'CORROSION TECHNOLOGY'

announces its SECOND

CORROSION EXHIBITION

27-30 APRIL 1959

Royal Horticultural Society's New Hall, Westminster, London, S.W.1

BRITAIN'S biggest-ever display of anti-corrosion methods and materials will be shown by over seventy exhibitors in London this coming April.

FOR four days from April 27, the Royal Horticultural Society's New Hall will contain the latest in corrosion prevention—new weapons in the ceaseless battle against corrosion.

THE exhibition will be a meeting point for those with corrosion problems and those with the answers. Whatever the industry you serve, you will profit from a visit to the Corrosion Exhibition.

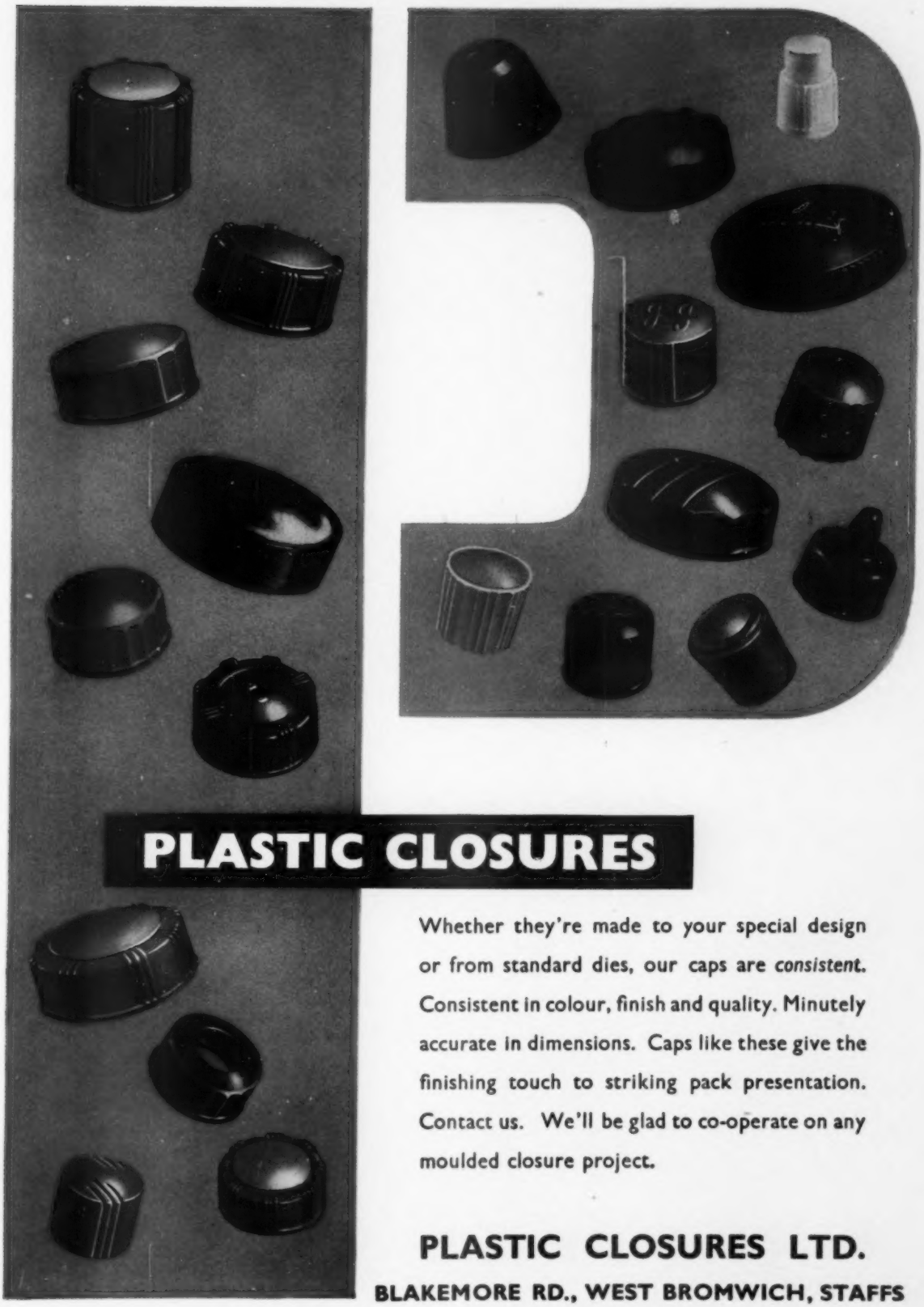
THE exhibition area will cover 20,000 sq. ft. of floor space.

THE opening ceremony will be performed on April 27 by Sir Owen Wansbrough-Jones, K.B.E., C.B., Ph.D., F.R.I.C., Chief Scientist of the Ministry of Supply.

METALS, PAINTS
PLASTICS
CATHODIC PROTECTION
WATER TREATMENT
FUEL ADDITIVES
METAL SPRAYING
GALVANISING
PIPE WRAPS

For your complimentary tickets apply to

The Organiser **CORROSION EXHIBITION**
Leonard Hill House, Eden Street, London, N.W.1.



PLASTIC CLOSURES

Whether they're made to your special design or from standard dies, our caps are *consistent*. Consistent in colour, finish and quality. Minutely accurate in dimensions. Caps like these give the finishing touch to striking pack presentation. Contact us. We'll be glad to co-operate on any moulded closure project.

PLASTIC CLOSURES LTD.

BLAKEMORE RD., WEST BROMWICH, STAFFS

and now—

METAL BOX OFFERS

printed

POLYSTYRENE TUBES

The *colour printed* polystyrene tube is the latest aid to the sale of tablets. Direct printing in two colours on the surface of the tube replaces labelling entirely, and the tube presents an extra smart and attractive appearance on the sales counter. Polystyrene tubes are tough and light. Each is effectively sealed by a one-piece polythene stopper, easy to remove and easy to replace. For additional sales-appeal a wide range of coloured stoppers is available. Please ask today for samples and further details.

Pack your products in containers that will not be left on the bathroom shelf! Metal Box polystyrene tubes are attractive and *specially designed to be carried in the pocket or handbag.*

CUT THE COST OF COTTON WOOL!

The Pillar Pack Stopper with the flexible prongs holds tablets gently in place, keeping them undamaged. No cotton wool is needed, no labour to insert it. The tube looks neat, clean and efficient. Pillar Pack Stoppers can be supplied with the ¾" × 2½" tube, and are used by ICI for the Savlon pack featured in the main illustration.

METAL BOX PLASTICS

The Plastics Group of
The Metal Box Company Limited
37 Baker Street, London, W.1.
Hunter 5577

Printed for the Proprietors, LEONARD HILL LIMITED, and published by them at their Offices, Eden Street, London N.W.1, by Billing and Sons Ltd., The London Printing Works, Guildford, England. Registered for Transmission to Canada including Newfoundland.